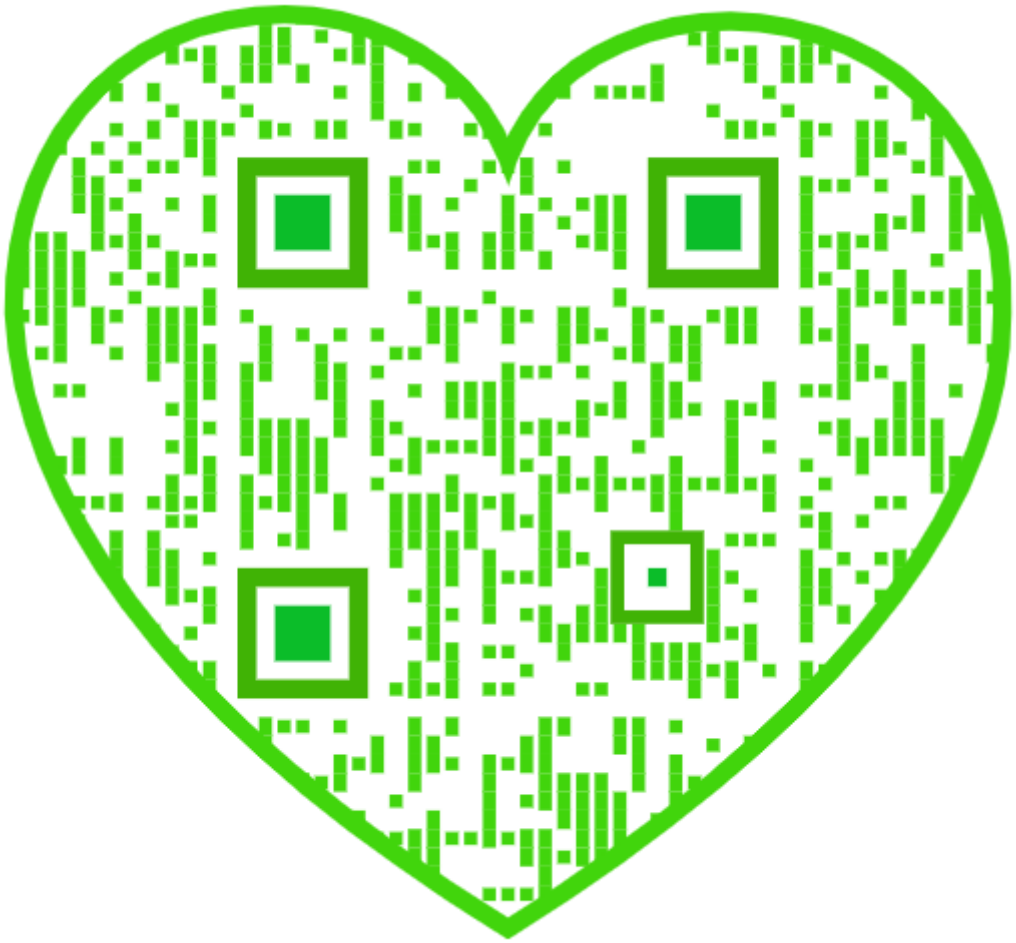

FIELD SANITATION

A MANUAL
FOR
NONCOMMISSIONED OFFICERS

BY

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Lt. Colonel, Medical Corps,
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(SECOND PRINTING)

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PREFACE TO FOURTH EDITION

This Manual is intended primarily for the enlisted man and more particularly for the Noncommissioned Officer on whom so much depends for the success or failure of camp sanitation.

JAMES SPRIGG WILSON.

Fort Geo. Wright, Washington.
August, 1914.

CHAPTER 1.

INTRODUCTION.

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INTRODUCTION.

Sanitation has been defined as the application of the laws of health, and Military Sanitation may be considered as the application of such laws to bodies of troops in barracks, and in the field. It is with the latter status of the soldier that the following pages deal.

It may be well at this time to speak of the importance of the comparatively modern subject of sanitation to the soldier.

For many years the armies of the world devoted themselves exclusively to a preparation for the infliction of the greatest possible punishment on a prospective enemy. It has been only within recent years that serious consideration has been given to preventable diseases, and the consequent ineffectiveness that a large body of troops may inflict upon itself by disregard of the most elementary rules of health.

For example: During the Mexican War, 22 men in each hundred died of disease, and but 5 in a hundred of wounds. Contrast this with the report of the Russo-Japanese War, where, with more modern sanitation, but four men died of disease per hundred. If we compare the ineffectiveness resulting

from disease in the Mexican and Japanese Wars, we find that the Japanese Army, where sanitary laws were understood and strictly enforced (unknown during the Mexican War) succeeded in retaining more than 127,000 men on the firing line, who would otherwise have been ineffective had the laws of sanitation been unknown or disregarded.

It is only fair to conclude that the student of the art of war can not but be interested in the subject of Sanitation, not only that he may secure comfort for his men, but to maintain the greatest number of rifles on the firing line as well.

CHAPTER 2.

CAMP DISEASES.

CHAPTER 2.

CAMP DISEASES.

a—Enumeration and importance.
b—Prevalence.
c—Prevention.
d—Typhoid inoculation.

CAMP DISEASES.

The most important diseases that affect troops in the field from the standpoint of an officer or noncommissioned officer of the line, are such as are preventable by the enforcement of the primary rules of sanitation. They are as follows:

Typhoid fever.
Dysentery; there are three varieties of this disease of which two are infective.
Malaria.
Yellow fever.
Dengue.
Diarrhea.
Sunstroke.
Pneumonia.
Cholera.
Measles.

Nearly one half of the admissions to sick report during an active campaign, are due to the diseases

mentioned, with the exception of cholera, yellow fever, measles and dengue. These latter diseases are mentioned because of their high rate of disability if they once gain a foothold in a body of troops. Briefly, the diseases just mentioned are usually contracted in the following way:

Typhoid fever, dysentery and cholera, by infected food and water. Malaria, yellow fever, and dengue, by the bite of an infected mosquito. Diarrhea, by improper food and drink. Sunstroke is usually due to the exposure of the head to the direct rays of the sun, without proper head covering.

TYPHOID INOCULATION.

Of the diseases enumerated none is more likely, considering the frequency with which they occur, to destroy the efficiency of an army, than typhoid fever. During our short war with Spain, of five months' duration, there were 20,738 cases of typhoid fever, and 1,580 deaths. Compare this with the report from the recent assembly of troops in Texas under similar conditions, where there were two cases of typhoid, both mild, with no deaths. In this connection it might be said that the typhoid prophylaxis as now administered, results in the formation of a substance in the tissues of the body, which prevents the action of the typhoid germ if taken into the system, thereby reducing the susceptibility of the individual. It is believed that this condition

of immunity, as it is called, lasts for a period of about three years.

In a recent statement prepared for the Department of Agriculture, Dr. Erwin F. Smith makes the following interesting statement on the use of the typhoid serum:

"This method has now been practiced on a large scale, chiefly in the armies of various nations, with striking results. It failed in the English Army during the Boer war, when there occurred 57,684 cases of typhoid fever and 8,020 deaths. But the cause of this failure is now well known. It was supposed at that time that the inoculated men were protected by inoculation, but it is now well known that the temperature at which the typhoid cultures were killed for these inoculations, was too high (60 to 65 degrees C.) It has been demonstrated repeatedly since that date that cultures killed at this high temperature lose all their protective power, and the bacterial cultures now used are sterilized at a temperature 10 degrees lower (53 degrees C. for 1 hour.)

"But in other places, for instance in the Japanese Army at the time of the Japanese-Russian War, the result was very striking. The Russian Army was largely incapacitated by fever, while the Japanese Army had practically no cases.

"Recently in the British Army in India typhoid inoculation has been practiced on a large scale, and

very careful records have been kept of all cases occurring among about equal numbers of non-inoculated and inoculated soldiers in the same regiments and subject to the same conditions. We have records of 20 regiments, and they show that even including one regiment that was inoculated with cultures heated too high the troops which had been inoculated have suffered very little from typhoid in comparison with the ones that were not."

CHAPTER 3.

PERSONAL HYGIENE AND CLOTHING

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PERSONAL HYGIENE AND CLOTHING.

a. Preparation for the field.
b. Rules for personal hygiene.
c. Care of the tent.
d. Mosquitoes and their relation to disease.
e. Venereal disease and its prevention.
f. Clothing with reference to
    1—Color.
    2—Fabric.
    3—Washing Woolens.
    4—"Cholera Belt."
    5—Head Gear.
    6—Shoes, their selection and care.
    7—The French Army Marching Strap.

PREPARATION FOR THE FIELD.

A large proportion of the non-effectives in our army in the war with Spain, were not in proper physical condition when they left their homes, with the resultant disability on arrival in the field. A man because of his desire to go into the field will frequently attempt to conceal his physical defects. It is the duty of a noncommissioned officer cognizant of the defect, to report the fact to the organization commander, in order that the attention of

the Surgeon may be specially directed to this man. Men who become incapacitated in an active campaign, require the care and attention of their comrades which can ill be spared at such a time.

RULES FOR PERSONAL HYGIENE.

The following rules ordered observed in the Japanese Army, and somewhat modified in this text, represent the basis of personal hygiene.

A. The body must be kept clean in order that boils, lice, and various skin diseases may be prevented. It is important, particularly with mounted troops, that the inside and back of the thighs and buttocks be clean, to prevent chafing.

B. The hair of the head should be trimmed close to prevent disease of the scalp.

C. The tooth brush should be used daily to prevent decay of the teeth.

D. The hands must be washed before each meal, and after returning from the sink. Disregard of this custom resulted in many cases of typhoid fever in our recent war with Spain.

E. The feet of dismounted troops should be cleaned daily on arrival in camp, and clean socks should replace the ones used on the march. If the feet are tender apply to the Surgeon for the foot powder provided for such a condition. Ingrowing toe nails are prevented by keeping the nails constantly trimmed squarely across. If the feet be-

come blistered, they must be given the most careful attention. Observe the following rules: Use only a needle to open a blister. Never open it at the top but as follows—first heat the needle in the flame of a match to kill the germs on it, then run the needle through the base of the blister and gently express the water. Having emptied the blister in this manner, a method of further treatment not generally known is to cover it with a piece of surgeon's adhesive, or, as it is commonly called "sticking plaster." This prevents the blister from refilling and permits it to heal.

F. Do not drink, or eat food prepared or sold, from an unauthorized source. One of the most serious contributing causes of intestinal ills and kindred diseases in camps of concentration, is the unauthorized sale of alleged ripe fruit, "digestible pastry" and "pure beverages", which are usually the reverse.

The necessity of the daily bath, when practicable, can not be overestimated, not only for the purpose of cleanliness, but because such a bath greatly refreshes one after a long and tiresome march.

CARE OF THE TENT.

A brief remark might be made at this point as to the care of the tent, more particularly however with reference to its contents.

1. Ditch your tent thoroughly immediately on pitching it, so that in event of rain the floor will not be flooded, and your bedding become wet, possibly with no opportunity to dry it for several days.

2. Air the ground covered by the tent daily, also raise the walls so that as much sun as possible will enter it. Do this not only to dry the tent floor, but also to obtain the disinfectant action of the sun. It is for the latter reason that usually once a week in a permanent camp, the tents are moved slightly to cover a new site.

3. Air the bed sacks and blankets on the tent guys and not on the ground, on account of the dampness. Do this daily if possible, as the bed clothes absorb the odors from the body very much more rapidly than when sheets are used.

4. Do not close the tent door entirely at night, as it is not generally appreciated that the fibres of the canvas swell at night after the dew falls, to a degree that makes the canvas almost air tight, and vitiation of the air in the tent results.

DISEASES OF THE INTESTINES. Disorders of the bowels are the most common ailment of the young soldier, and of these diseases, constipation, with its attendant ills, is the most frequent. A daily stool is necessary for health. A most important point in this connection is to designate a place immediately on arrival in camp, for the men who wish to relieve themselves at once,

and to construct at least a shallow pit. Nothing is more demoralizing to all efforts toward proper camp sanitation than to permit the men of the command, on going into camp, to relieve themselves in the nearest place available, regardless of the purpose for which the ground may be used later.

MOSQUITOES. The use of the mosquito bar is not always enforced as strictly as it should be. If not used in countries where malaria carrying mosquitoes are found, the result is malarial fever. A report should be made promptly if, in a permanent camp, a place is found where mosquitoes are breeding. The breeding place should be immediately destroyed. Mosquitoes will breed in old tin cans, bottles, or anything that will hold a little stagnant water.

VENEREAL DISEASES. This type of disease is prevalent in all armies, and causes considerable disability. I would correct an impression that veneral indulgence is necessary to remain in good health, and I warn you of the dire consequences attendant on venereal infection. In order to minimize the danger from venereal infection and to protect the individual from the results of his own misconduct the War Department has issued certain orders, (G. O. No. 17, W. D. 1912 and G. O. No. 71, W. D. 1913). A careful reading of these orders is recommended.

CLOTHING. The importance of suitable clothing for the soldier has of recent years received much attention, and very properly so, not only for the comfort of the individual, but also because it increases his efficiency. The reason for the adoption of various colors for their uniforms by armies, is out of place in such a monograph as this. White or at least, light colored garments, are preferred in the tropics, because they reflect the rays of the sun, and are therefore cooler than the black or dark colored garments, which absorb the heat.

The two principal functions of clothing, and by that I mean the uniform, are:

1. To protect the wearer from heat and cold, and the elements.

2. To distinguish members of the different branches of the service from each other, or, from the opposing forces. To the latter function no reference will be made.

The two principal fabrics used are wool and cotton. Wool, because it conducts heat badly, is far superior to cotton.

Inasmuch as the ordinary woolen underclothes can be easily rendered almost unserviceable by improper washing, it is suggested that they be laundered as follows:

1. Put the clothes in warm soap suds and move them about freely.

2. Next, place them in clean, cold water.

3. Hang them out to dry, and on no account wring them.

Many times in the field it will be found impossible to wash underclothes, and have them dry in time for the next day's march. In this event they can be freshened materially, by thorough brushing, shaking and sunning.

A point that is often overlooked because of its apparent unimportance, is to see that the buttons on the clothing are replaced when lost. If this is not done, particularly with underclothing, chafing or blistering may result from an improperly fitting garment.

For many years it has been recommended that in the field the "Cholera belt" be worn around the waist. This belt consists usually of a band of woolen material. It frequently rolls up into a rope-like mass, and ceases to exercise the function for which it is intended, viz: to protect the delicate organs of the abdomen. A much better, simpler, more economical and satisfactory appliance, is the "Cholera apron", which covers the front of the lower part of the abdomen, fastening around the waist by two pieces of tape. This accomplishes all that the cholera belt does, and has none of its disadvantages.

In an effort to present a "smart" appearance, men often "draw" their outer garments too small. Clothing, especially for the field, should be loose and comfortable. No constriction of the chest is

permissible, in order that the movements of the body and particularly those of respiration may be free from restraint.

Many men use a belt to hold up the trousers. Suspenders are better, as the belt places too much pressure on the abdomen.

HEAD GEAR. The head gear of the troops, both in hot and cold climates, is important. The present head gear of the service seems to fulfill all requirements, but in very hot weather it is often desirable to place a handkerchief or a large leaf in the crown of the service hat to increase the protection from the sun's rays. It is also recommended that the hat be removed whenever the wearer is in the shade, to cool the head, and also to dry the hatband.

SHOES. The importance of correctly fitting shoes is frequently overlooked, or disregarded by the inexperienced soldier. The result is always readily seen in commands where this important feature is disregarded. As an example of the importance of the proper care of the feet, it might be noted that in the early part of the Franco-Prussian War, the German Army during a given period lost from killed and wounded, 60,000 men, and during the same period 30,000 men were incapacitated for duty by injuries to their feet. I recommend that properly fitting shoes be obtained, that they be well "broken in" before leaving the post, and that they be given a thorough coating of neatsfoot oil several days

before taking the field. On the march when shoes become wet, fill them with hay or straw and do not place them too near a fire to dry. When dry, give them a good coating of oil or any available form of fat.

SELECTION OF SHOES.

Inasmuch as the soldier is required to wear the issue shoes, a discussion of the various types of shoes is not desirable at this time. A few points of interest in the matter of selecting shoes, however, are as follows:

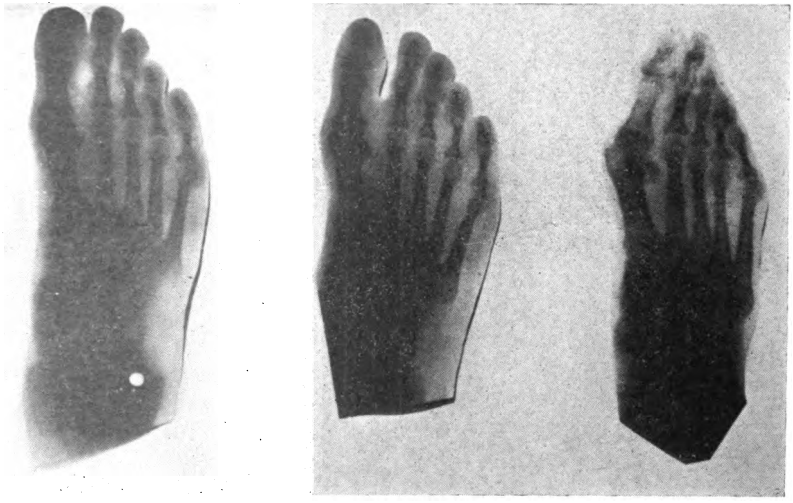
1. Avoid selecting a shoe with too low an instep, or too loose an instep, the former defect being frequent in the selection of issue shoes.

2. Remember that the feet swell after a long march, therefore, have the shoes roomy.

3. Remember that when the weight of the body is thrown on the foot as in walking, there is considerable widening of the foot, and also a slight lengthening. A marching shoe, therefore, must be comfortable when the entire weight of the body is thrown on either foot.

4. In "drawing" a shoe for use on foreign service, select one a quarter to a half size larger than usual as the feet of an individual either enlarge, or seem to, in the tropics. In cold countries a heavier sock is usually worn.

PLATE 1.—RADIOGRAPHS OF FEET.



The figure on the left shows radiograph of foot not supporting weight of body. Note apposition of toes. Figure in center shows separation of toes when the weight of body is thrown on foot. Note expansion of foot. Figure on right shows deformity subsequent to prolonged use of a too narrow and pointed shoe.

5. Be careful however, not to choose a shoe too large, as it is likely to chafe or produce a blister from rubbing.

6. Illustrations of the normal, and also of the deformed foot are seen in the radiographs in Plate No. 1. Recently the French Army adopted a method of treating feet blistered while on the march. It is as follows:

Take a strap half an inch broad, (the ordinary coat strap from the regulation saddle, answers very well) and spread it on the ground, place the instep of the foot over its center, bring up each end of the strap over the top of the instep, cross and bring around the ankle and buckle. (Illustrated in Plate No. 2). So satisfactory is this method, that it is claimed that men who were suffering with blistered feet were cured by wearing this appliance, even though marching 15 or 20 miles a day.

Under ordinary conditions the light woolen sock, as now issued in our army, owing to its elasticity and absorbent qualities, furnishes a most excellent foot covering. It is however, imperative, particularly for foot troops, that a clean, or at least, a fresh pair of socks be put on each day. It may sometimes happen that it is impossible to wash or to change the socks. In this event it is recommended that they be aired and sunned, turned inside out, and replaced on the feet.

PLATE 2.—MARCHING STRAP. (Coindreau)

This device has been used in the French Army for the prevention of blistered feet.

In this connection the writer has observed, in recent years, particularly since the issue of the light weight woolen sock, that a number of cases of sore feet have occurred from wearing a sock that is too small, or one shrunk from being improperly washed, causing by its constriction a deformed position of the toes, and sore feet, although the shoe may be an excellent fit. Men should therefore be taught to stretch their socks if necessary before putting them on, and at the end of the march shake them out, and after stretching them put them on opposite feet.

CHAPTER 4.

WATER.

CHAPTER 4.

WATER.

a—Amount required and its importance.
b—Allowance in camp and on the march.
c—Varieties of water. Description of each.
d—Non-potable water.
e—Purification of water by
Boiling.
Mechanical sterilization.
Precipitation.
Filtration.
Chemicals.
f—Location and arrangement of appliances.
g—The water can.
h—Guard and care of the water supply.
i—The care of the canteen.

WATER AND ITS PURIFICATION.

The importance of an abundance of pure drinking water on the march can hardly be estimated, particularly in hot climates, as water forms 60 per cent of the body weight. The reason that water is so necessary for troops, and particularly for dismounted troops, is, that a man under ordinary conditions where exertion is necessary, gives off several pints of water each day in the expired air and perspiration and it is essential constantly to replace the water lost by the body.

THE AMOUNT OF WATER REQUIRED. This will vary of course, with the temperature of the air, and whether the individual is mounted or not, as a dismounted man of necessity exerts himself more on a march than a mounted man, and requires, as a result of his excessive perspiration, just that much more water.

ALLOWANCE OF WATER IN FIELD. A fair allowance is as follows:

One canteen full for cavalry, and two for infantry, if the day is very hot, and the march long. In camp, however, the allowance is dependent largely on two factors, viz., the supply available and the difficulty of getting rid of the polluted water without an elaborate system of drainage.

In estimating for live stock, a horse drinks from 6 to 10 gallons per day, and one to two gallons at a time.

VARIETIES OF WATER. Having taken up the subject of the necessity for water in the field, a brief remark might be made enumerating the different varieties usually found. A good classification is as follows:

1. As to source: { *a.* Deep water. *b.* Surface water.
2. Composition: { *a.* Hard water. *b.* Soft water.
3. Infected, or polluted water.

Assuming that the classification just mentioned is sufficient, it may be well to discuss the various kinds of water.

DEEP WATER. Ordinarily, water from wells over 50 feet in depth is assumed to come from underground sources and is called "deep water." It may be considered the only water safe to drink without purification. Even these deep wells, when subjected to too great drain, as for example, supplying water for two or more companies, may become polluted by the entrance of impure water.

SURFACE WATER. This kind is drawn from shallow wells, streams, and most springs, and is not usually suitable for drinking unless purified.

Water of this class is almost certain to have been contaminated by sewage or drainage from privies of the neighboring houses.

Wells in the country are seldom over 50 feet deep, and their use should be avoided.

Water for drinking should be taken only from sources which have been approved by the commanding officer.

HARD WATER. Hard water may be defined as water containing an excess of lime. Hard water is undesirable because it does not make suds with ordinary soap, but there is no reason why it should not be healthful.

SOFT WATER, the best example of which is pure rain water, is almost without salts or lime, or any other mineral matter.

INFECTED, CONTAMINATED, OR POLLUTED WATER. These waters usually contain germs of disease, and will cause sickness if used for drinking.

Under this heading may be considered the so-called "soft drinks", sold in such large quantities in camps of concentration. In this class are soda water, ginger ale, lemonade, milk, and milk shakes, and many similar drinks that are very dangerous when sold under the circumstances just enumerated, as they are usually improperly prepared, and frequently made from infected water, or milk. The sale of these articles should only be made by authorized persons, and under proper supervision.

SPRING WATER. The belief is widespread that spring water is suitable to drink. This can not be accepted as a rule. A spring having a constant flow of cold water regardless of the temperature of the air, probably arises from a "deep water" source and may afford excellent drinking water. On the other hand, a spring which yields a flow of water, varying in quantity with the rainfall and in temperature with the atmosphere, undoubtedly has a shallow surface source and is in all probability polluted. Even an expert can tell very little about water without making certain

tests and the fact should be impressed on every man that water which is clear, cool and without odor is not necessarily safe for drinking.

NON-POTABLE WATER. Water may be unfit for drinking because of one or more of the following reasons:

1. It may contain fine sand, leaves, or clay, in other words, be muddy. This type of water even if it contains no germs, will frequently cause diarrhea, if used for drinking.

2. Water that is clear and apparently pure, but may contain disease germs.

3. Water that has been contaminated by sewage or similar wastes.

The following diseases are most frequently contracted by drinking impure water:

1. Cholera, not seen often in this country, but in the Philippines.

2. Typhoid fever, common throughout the United States, and very common in the country, where the people use the old-fashioned privy, and drink from surface wells.

3. Dysentery and diarrhea, very common in the United States, and also in the Philippines.

The above-mentioned diseases are those we are most likely to contract by drinking infected water.

As has been said, it is fair to presume that all water that is available on the march is surface water and therefore not suitable for drinking unless sterilized.

WATER PURIFICATION.

As we have discussed the commonest defects of drinking water in the field and on the march, it will now be shown how these defects can be removed.

1. Hard water. This class of water is objectionable because of the excess of lime, and can be greatly improved for drinking and cooking, by boiling which removes the lime, depositing it on the bottom and sides of the vessel.

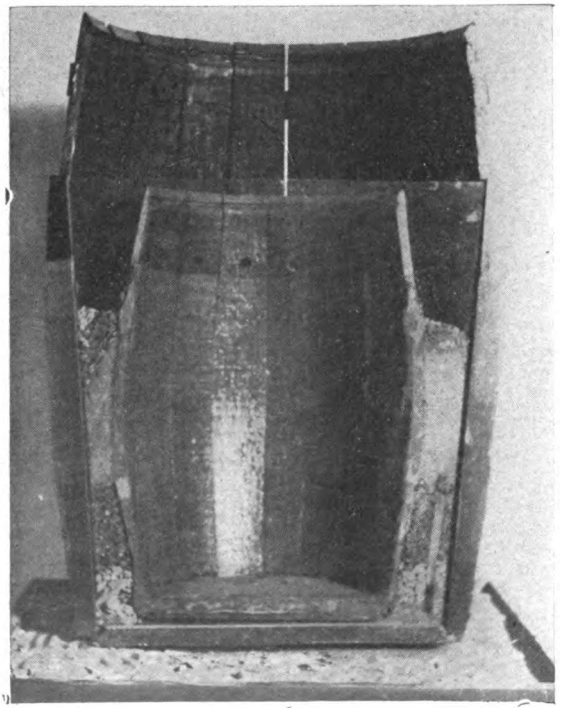
2. Water may contain leaves, sand, clay, etc. To remedy this strain through a cloth, or better, through a rude form of filter consisting of two barrels one within the other, with the intervening space packed from below up with, 1st, coarse gravel, 2nd, fine gravel, 3rd, sand, and 4th, fine gravel. The outer barrel is pierced with 12 to 15 holes near the bottom of the sides, and the inner barrel similiarly pierced about two thirds the way up as shown on Plate No. 3.

3. Water may contain the germs of disease. This is the most dangerous variety of water, and the greatest care is necessary to render it suitable for drinking.

WATER PURIFICATION.

There are many ways of purifying water in the field. If one method could be adopted which would be applicable to all cases, our problem would be simplified, but since varying circumstances require different methods, it is necessary to become familiar

PLATE 3.—BARREL FILTER. (Vertical Section)



Showing two barrels, one within the other, with the intervening space packed from below up with, 1st, coarse gravel, 2nd, fine gravel, 3rd, sand, and 4th, fine gravel. The outer barrel is pierced with 12 to 15 holes near the bottom of the sides, and the inner barrel similarly pierced about two thirds the way up. This filter is placed on the bed of a stream, and the partially purified water drawn from the inner barrel.

with several of the principal ways by which purification is accomplished.

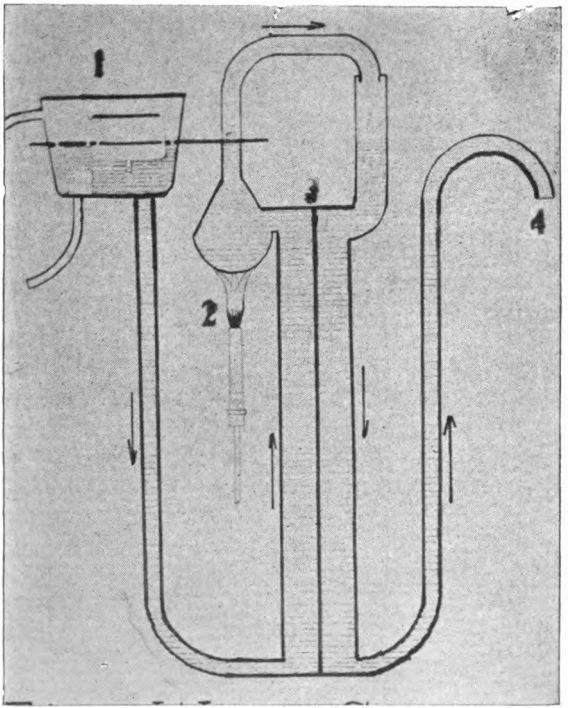
1. BOILING. This is the most satisfactory method for the destruction of all germs in the water, but has the disadvantage that it renders the water undesirable for drinking until it becomes cool, which usually requires several hours. When this method is used, the water should be boiled for twenty minutes.

2. THE FORBES STERILIZER. This is an appliance which has been widely used in the service. It depends for its action on the expansion of water when heated. The water is heated to the boiling point and is sufficiently sterilized for drinking. It is delivered but a few degrees warmer than when it entered the apparatus, which is illustrated in plate No. 4.

The water enters the tank, 1, where a valve prevents too great a "head", passes as indicated by the arrows over lamp marked 2, where it becomes heated and then passes up through the U shaped tube in direction of arrows to exit at 4. The water has in above process become momentarily boiled but an exchange of heat occurs at the thin partition marked 3.

PRECIPITATION. This method, now frequently used, consists in the addition of ordinary alum to impure water. If we place water in an ordinary camp kettle and add six grains of alum (roughly, as much as will cover a ten cent piece),

PLATE 4.—FORBES STERILIZER (DIAGRAMATIC).



For a description of this appliance see page 36.

for each gallon, a scum will form on the top of the water. If the water be set aside, we find in the course of an hour or so that the scum has fallen to the bottom, carrying with it all particles of dirt and practically all of the germs. The top water, if carefully poured off, will be found suitable for drinking.

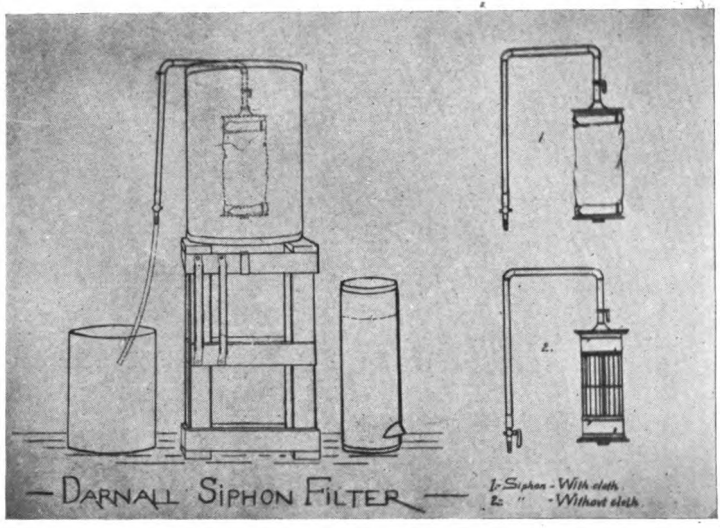
The DARNALL FILTER. A diagram of this appliance, which is in use throughout the Army, is shown in Plate 5. It utilizes the principle of "precipitation by alum" described above and counteracts any excess of alum present in the water after precipitation is completed, by the addition of sodium carbonate.

From recent experience the Darnall Filter appears to be the simplest, most easily managed and transported of any of the modern field appliances for the purification of water that have been given an extensive trial.

4. CHEMICAL PURIFICATION. Quite recently this method has been generally advocated by Messrs. Nasmith and Graham, of Ontario, Canada, as follows:

1. Take a teaspoonful of chloride of lime.
2. Dissolve in four cups of water.
3. Place in a tightly stoppered bottle. (This solution is best when freshly prepared, but may be kept for four or five days).

PLATE 5.—DARNALL FILTER



This is a very efficient, compact, and easily transported appliance. The illustration above shows the filter cage with and without the cloth, and the filter cage in place at the left, with cans for water. In the left center is shown the crate for the appliances. All the parts of the appliance "nest" in the largest can.

4. Add one half teaspoonful of this mixture to a gallon of water, stir thoroughly, and allow to stand for ten minutes. "This will destroy the germs of typhoid fever and dysentery in the water, and leaves no odor or taste of the lime."

As far as is known this method has not been tried in our army while in the field. It is believed to be of service in the purification of water where it is not deemed practicable or advisable to make a fire, or use the Darnall filter.

LOCATION OF APPLIANCES FOR THE PURIFICATION OF WATER.

In the location of appliances selected for the purification of water, a "battery" system is recommended. By this term is meant a grouping of the various appliances, so that the feed and delivery of the water will each be from a common receptacle. This system has many advantages. The principal ones are: There is a continuous flow of water for the entire command, and if the sterilizing apparatus of one unit is working improperly, that organization is not deprived of water. The number of supplementary appliances for sterilization is also reduced. The most important feature is that the work is performed at a single central point, resulting in a greater efficiency in working the appliances, and that the guard, personnel, and supervision, is reduced to a minimum.

WATER CANS. With each sterlizer, have a galvanized iron can with a faucet attached, for distribution of water to each organization. This type of can has its disadvantages as it is hard to pack, and the faucets are often broken off, but it prevents an inexperienced man from dipping a dirty cup or canteen into the water, thereby fouling it for the entire organization. For the same reason each organization should have a similar can for the company street, for drinking water, one also must be furnished for the kitchen.

Do not have a common drinking cup at the water can, as frequently men who are afflicted with syphilis or other diseases, will by this means infect other men of the organization.

The following suggestions are made concerning the care of the water can. The can must have a tight cover; This cover must not be removed by unauthorized persons. Accordingly, it may be, and usually is, necessary to put a lock on the top. The can must be in a convenient place, and in the shade if possible. Raising the can on an improvised stand accomplishes two purposes; it prevents contamination from the ground, and makes the water accessible, thereby removing the temptation to drink from unauthorized sources. Scald the can each day inside and out with boiling water.

Do not forget that you can easily infect good water by adding impure ice to it, and that water

when changed into ice is somewhat purer than the water from which it is made, but is not necessarily suitable for use in the drinking water.

Always remember that the greatest care is necessary to protect your drinking water from becoming infected by dirty hands, utensils, and dust.

The following suggestions are believed practical, and certainly necessary to prevent contamination of water in the field.

GUARD AND CARE OF WATER SUPPLY.

In small commands where you may be in charge, or in large commands where you reach the ground selected for camp ahead of the command, I would caution you to detail one or more men as guard over the water supply, for the twofold purpose of preventing anyone from contaminating the water, and also to prevent members of the command from drinking it until pronounced wholesome by the Commanding Officer.

Do not permit dogs or horses to foul the stream or water supply, and water your horses as far down the stream as possible, until the troops come up, and the Commanding Officer selects a place for that purpose.

If the water supply be a well, be careful that the members of the command do not throw water on the surface of the ground near the opening as it may run back into the well and infect from dirt on

their feet the otherwise pure water. This is a very common practice and is very dangerous.

Occasionally it will be found, and particularly in large commands, which are necessarily dependent on streams for their water supply, and not on springs or wells, that the water becomes very foul when it is dipped from the stream. To prevent this, two barrels can be arranged as shown in Plate No. 3, to form a crude filter, and the water that has been dipped from this appliance is then suitable for further purification.

Difficulty is often experienced with untrained troops in constraining them to drink distilled or boiled water because of the "flat" taste. This condition is due to the absence of air in the water, and it can be made palatable by pouring it from one bucket to another several times from a height of six or eight feet. In this manner particles of air become entangled in the water and the "flat" taste is removed.

In concentration camps the following suggestions will aid in the proper care of the water supply.

1. Do not waste the water, as often the supply is limited, and the problem of disposing of considerable quantities of waste water in camp is a serious one.
2. Place crushed rock around your faucet stand pipes, as it prevents the waste water from forming a pool at the foot of the pipe.

3. On leaving camp take when possible a canteen of water as usually the water furnished in camp is the only potable water obtainable.

CARE OF THE CANTEEN. The canteen is the only receptacle we have at present for carrying water on the march, excepting the water keg carried on the company wagon. It is believed however, that in a short time some type of water wagon will be adopted.

The care of the canteen is often neglected, and I would recommend that the following suggestions be carried out.

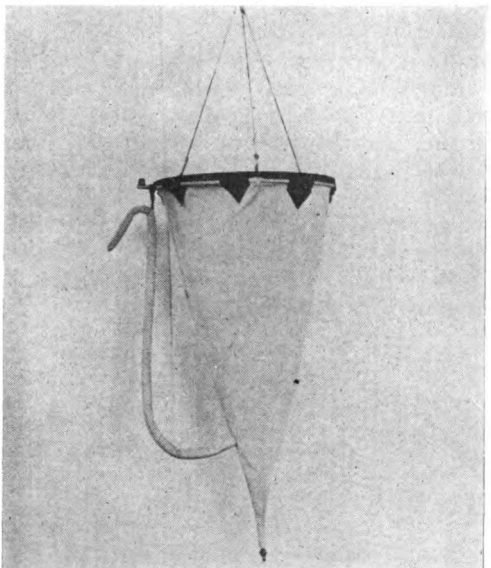
1. Scald the canteen inside and out before leaving the post; this is important in all cases, and removes the sizing on the cloth on the outside of a new canteen, making the covering more absorbent and the contents of the canteen cooler.

2. In order to cool the contents of the canteen for the next day fill it at night, wet the outside covering, remove the cork and hang in the breeze until morning.

3. Avoid the bad habit frequently seen among the untrained, of drinking too much water on the march. The man who empties his canteen early in the day, is likely to drink water from an unauthorized source on the march or in camp, before a suitable supply can be obtained for him.

4. Avoid the bad habit of indiscriminate drinking from another man's canteen as the same results

PLATE 6.—WATER BAG.



The principle on which this device depends has been long in practice in hot countries, and is that evaporation of water from the outside of a container will cool its contents. The appliance as designed by the author, consists of a bag of heavy canvas on an iron ring.

The opening of the bag is protected from dust by a hinged lid. At the side of the bag is a canvas tube by means of which the water is siphoned off preventing contamination. The bottom of the bag is pointed to facilitate precipitation of sediment.

follow as from the use of the "common" drinking cup.

5. Make it a rule to scald the inside of the canteen at least once a week while in the field.

6. It is not generally realized, but in very cold weather the canteen may be used when filled with boiling water for purification as a very fair hot water bottle.

Very frequently in hot countries where ice is not available the principle of evaporation is used to cool water. An appliance on which this principle depends is shown in Plate No. 6.

CHAPTER 5.

SUBSISTENCE.

CHAPTER 5.

SUBSISTENCE.

a—Location and types of kitchens in the field.
b—Care of kitchen and food.
c—Bread; varieties in the field.
d—The field mess.
e—Canned food.

SUBSISTENCE.

This chapter deals with the subject of food from a sanitary standpoint, and only so far as it affects troops in the field.

KITCHENS; LOCATION. In discussing the question of food and its preparation it may be well to speak first of the kitchen in the field, and in taking up the subject of kitchens, I would call the attention of the reader particularly to the fact that the kitchen is no longer located in the position it was a few years ago, between the end of the company street and the sink, but at the opposite end of the company street. This is a much better location as it lessens the danger of infection from the sink by flies, which in time gone by has no doubt frequently occurred.

TYPES OF KITCHENS. There are three types of field kitchens that may be considered, their use

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depending on the duration of the camp, equipment available, and other obvious reasons.

THE FIRST TYPE is used in a camp for one night, and on the march, and consists of two large logs about 8 to 10 inches in diameter parallel to each other in the direction of the wind; the distance between the logs is just enough to rest the bottom of a camp kettle on them. No cover is usually put up for this type of kitchen.

THE SECOND FORM is a trench parallel with the wind, about eight inches broad and six feet long. It is one foot deep at the end from which the wind comes, rising up to within three inches of the surface of the ground at the other end.

Another trench of the same dimensions as this, intersecting the first at right angles at the centre, is frequently made. This is useful if the camp is to be used for several days, as it provides for a change of wind.

On one side of the kitchen a "wind break" should be made of brush. If the camp continues for several days, it will be found an advantage, particularly in summer, if a shade of brush or pine branches be built at a point near the fire, and at least 8 feet high. A shade lower down is likely to catch fire from sparks. A crane can be used over the fire although in most organizations are found forked iron uprights with a horizontal bar. If wooden uprights are used to support the bars for the kettles on the

camp fire, they must be at least four feet long, with one end forked and the other sharpened and driven into the ground about a foot and a half.

THE THIRD TYPE of kitchen is the one adopted by the Quartermaster General in 1908. It is about 20 feet square and consists of a building that can be quickly put up and taken down, easily screened from flies.

This type is for use with a field range at more or less permanent camps. It is very satisfactory.

A thorough ditching of the kitchen is necessary no matter what type is used. This should be done promptly on arrival in camp, as nothing is more discouraging than to have the floor of the kitchen flooded during the preparation of a meal. A ditch six inches in width and half as deep, usually suffices, provided it is led off where there is a good fall.

CARE OF THE KITCHEN. The following are a few rules for the care of the kitchen:

Have it clean.

Have the floor well tamped and sprinkled before each sweeping. This lays the dust.

Put up a tent fly on the march whenever possible, or both tent fly and brush shelter in a more permanent camp, to protect both cooks and food from the weather.

Keep all food covered.

Cover at once and burn all slop and refuse from the kitchen. This is most essential to discourage flies and guard against disease.

THE COOKS. They must be clean in the matter of clothing.

Must take the greatest care that their hands and finger nails are clean.

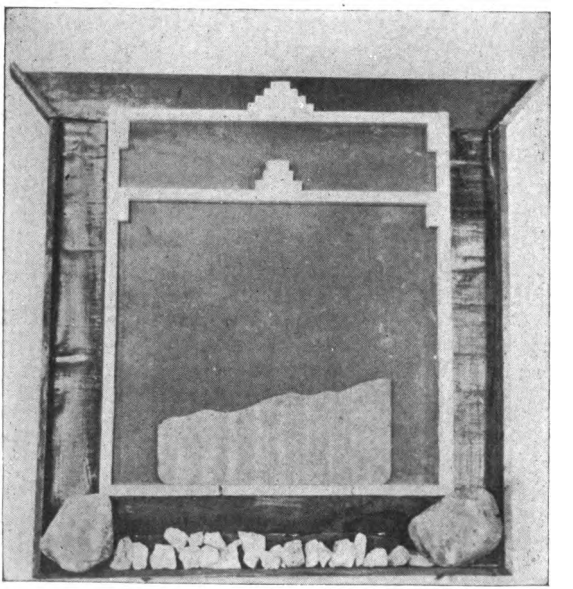
Nor be allowed to sleep in the "store" tent, with the food and cooking utensils.

All utensils must be kept constantly clean when not in use, to (prevent attracting flies,) and covered to prevent soiling from dust.

CARE OF BREAD. Bread is frequently very carelessly handled, and it is recommended that a clean shelter half or other suitable covering be used to cover the bread while en route from the bakery to the kitchen. After the bread is cut it must be covered to prevent contamination from flies and dust. This applies not only to bread, but to any food before it is served.

IMPROVISED ICE BOX. In large and more or less permanent camps, where ice is furnished, the need of an improvised ice box will be felt. Some organizations simply dig a pit, and wrap the meat and ice in a shelter tent or poncho, endeavoring to protect the meat in this way, obviously a poor arrangement. A very good type of ice box is that shown on Plate No. 7; it is a modification of the one shown in the Manual for Army Cooks.

PLATE 7.—IMPROVISED ICE BOX.



Showing the double lid, and air space at bottom, with drain holes in the box. The ice box may be made single or double by placing one box within the other, and packing the intervening space with hay or sawdust, the latter being preferable. The above illustration shows the "double" ice box without the bay or sawdust packing.

ON THE MARCH. On the march men are very apt to eat fruit that is either unripe or over-ripe. Especially are recruits apt to do this, and frequently it results in abdominal pain and diarrhea, nausea, vomiting, and one or more days on the sick report. The same symptoms though more serious come from eating "sour hash". This is most common on the march, as cooks are prone to minimize work in the morning by warming for breakfast, food that was left over from the meal of the night before. In summer, when there are no facilities for keeping food cool during the night, hash and similar dishes frequently turn sour, and if eaten will set up the so-called ptomaine poisoning. The consequences of this are very serious. There may be extreme prostration and occasionally death.

THE VARIETIES OF BREAD FURNISHED.

A complete discussion of bread, and particularly the bread that is furnished in the army, would fill many pages, but the following are a few points of interest:

There are three types of bread furnished for use in the army.

1. Hard bread, or "hard tack." This type, it is believed, will be seen less frequently in the future than in the past.

2. The ordinary white bread such as is found in the city bakery and furnished in permanent camps.

3. The new field bread recently adopted by the War Department. This bread has a thick crust, is made to withstand long transportation, and will keep for two weeks or longer. It is intended for troops separated from bakeries. To refreshen this bread after the crust has become hard and dry through long keeping, it may be wrapped with layers of wet cloth and reheated in the oven for 30 minutes.

As you know, ordinary bread depends for its lightness and palatability on the presence of myriads of little holes in its substance due to the presence of a gas in its preparation. This gas is formed in one of several ways; either by the fermentation of yeast, the presence of baking powder in the dough, or by forcing a gas into the dough before baking.

The field range will often not be available for baking bread. In this event it may be necessary to extemporize an oven. There are many varieties of improvised ovens, they are shown and described in the Manual for Army Cooks.

MESSING IN THE FIELD. Organizations, are required to eat at a designated point under shelter, and not permitted to carry off their food and eat it at random in their tents, or in the company streets. This happens frequently with untrained troops. It is the duty of the cook to see that the "kitchen police" thoroughly clean the site used for eating after each meal.

TINNED MEATS AND VEGETABLES. Modern improvements in the preservation of food have resulted in a large part of the soldier's ration for the field being issued in cans. For this reason the following rules may prove useful as an aid in determining if a can of tinned meats or other food is spoiled, or at any rate, if it should be brought to the Surgeon for examination and opinion as to its wholesomeness.

A can should be rejected as unfit for use:

1. If perforated by nails.
2. If badly dented, especially on the edge, resulting in the admission of air and with it the germs of decomposition.
3. When a can is bulged at the ends. This is caused by gases formed by decomposition of its contents.
4. When a can is found that is not air tight from any cause or does not have the ordinary odor when opened.

In case of doubt the Surgeon should be consulted.

CHAPTER 6.

WASTES.

CHAPTER 6.

WASTES.

a—Varieties of wastes.
b—Disposal by various methods.
c—The care of the sink.
d—The use of lime in camp.
e—The urine can.
f—The house fly as a carrier of disease.

WASTES AND THEIR DISPOSAL.

The disposal of wastes is probably the most important problem that concerns the Sanitary Officer, and can be carried to a successful issue only when each individual coöperates by observing the laws of health.

VARIETIES OF WASTES. Wastes are divided into four classes.

1. From the company streets: For example, leaves, paper, dried grass, etc.

2. From the kitchen: As spoiled or uneaten parts of fruit, or vegetables, potato peel, bones, slop, etc.

3. Waste water from the bath.

4. Droppings at the picket line.

5. Urine and feces. This is the most important of the wastes.

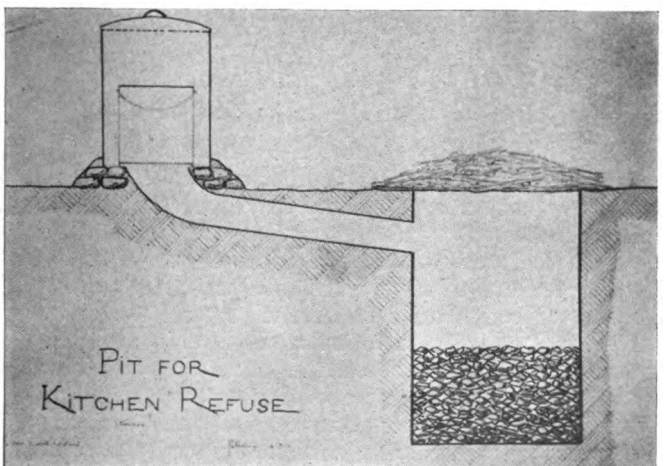
Having outlined what constitutes the various camp wastes, we will now take up the best methods of disposing of them.

1. WASTE FROM THE COMPANY STREET. This should be collected in sacks, to prevent its being blown away while in transit to a point to the leeward of the camp, and burned. It is a good plan to hang sacks at a convenient place in the company street to be used as repositories for ordinary "trash" that accumulates daily.

2. WASTE FROM THE KITCHEN is divided into two classes, liquid and solid. Liquid waste, such as dish water, is best disposed of on the march, and in a temporary camp, (one not again to be occupied by troops), by digging a pit in the ground near the kitchen, and, when possible, filling it half full of stones. Over the pit place a cover made of brush and earth, or other material. This will prevent anyone from falling in, and also screen the entrance against flies. This cover should be made so that one portion can be removed and the kitchen slop poured into the pit through a strainer of burlap or wire. Except when this is done the cover must be kept on. The dimensions of this pit are about four by four by six feet deep. Only liquid waste is poured into this pit; the solid matter is burned in the kitchen fire.

A type of pit shown in Plate No. 8 is believed sometimes to be useful. As the pit may be separ-

PLATE 8.—KITCHEN PIT.



This method of disposing of a fluid part of the garbage is particularly to be recommended in a camp on very sandy soil, as for example, near coast defenses. The garbage is poured into the inner can the bottom of which is a strainer. As occasion requires the solid portion of the garbage in the inner can is burned in the kitchen fire.

ated some distance from the kitchen, it has its advantages.

Another and a better method for the disposal of both liquid and solid garbage, in a semi-permanent

camp is an incinerator used for years in the English Army. It consists of two shallow trenches at right angles to each other, intersecting at the center. A central chimney is made of sods, or, better, a barrel covered with clay having a thickness of from six inches to a foot. Its efficiency is greatly increased if an improvised grate is made at the intersection of the two trenches by placing six or eight pieces of old wagon tire or other scrap iron at the sides and bottom of the trench. Line the trenches with rock of from four to six inches in diameter, and flare the ends of the trenches so as to increase the draught. The dimensions of the trenches are as follows: Length, six feet, width, one foot, depth, one foot in the center, sloping gradually upward to the surface. The garbage is burned by throwing the solid portions into the improvised chimney, and pouring the liquid part on the hot stones where it is evaporated. This type of incinerator has been found from personal experience and observation to be perfectly satisfactory, in that it permits a direct draught from four directions instead of two, if a shallow rock lined trench be used.

An objection to this appliance, in common with many devices for incineration of kitchen garbage, is that special material is required for its construction, and that usually some little time elapses before completion of the work; meanwhile the garbage accumulates, with no adequate means for its disposal. An

incinerator that has proved satisfactory in every particular to the author as Sanitary Inspector, and also to the organizations concerned in its operation, consists of a trench, 6 feet long, 2 feet wide, and 2 feet deep, filled with crushed rock. A small ramp of earth about 3 inches high at the edge of the trench prevents the entrance of surface water. Incineration by means of this appliance is quite economical. Only nine sticks of cord wood per day generally suffice to incinerate the garbage from a troop or company. A fire is built on the crushed rock; the liquid portion of the garbage is poured on the heated rock where it evaporates, and the solid portion burned in the fire.

Any form of incinerator it is believed has an advantage over the "pit" system for the disposal of camp wastes. The writer has observed that in using the "pit" system, even with the most careful supervision by company officers the top of the pit and surrounding ground becomes polluted in four or five days, and swarms of flies appear in the immediate vicinity of the kitchen.

The kitchen incinerator has many advantages. It provides a place for immediate disposal of all kitchen garbage, and eliminates the garbage bucket and can, always a fruitful source of filth, which attracts flies to a locality least desired.

The new field range, recently issued, may be utilized in burning kitchen waste. To what degree it will prove successful has not yet been determined.

A description of this range can be found in Circular No. 16, Office of Chief of Quartermaster Corps, June 19, 1912.

THE GARBAGE CAN. The care of the garbage can (issued by the Quartermaster's Corps), in permanent camps is important. The cover must fit properly and always be in place except when it is being filled or cleaned. The outside of the can must be clean at all times that it may not attract flies. The can may be raised on a rough platform, say of ordinary cord wood in order to facilitate emptying and that particles of food may not remain under the can and decompose there. The ground around the can or barrel frequently becomes polluted, owing to carelessness in emptying or in placing garbage in it. This becomes an excellent medium for the breeding of flies, besides causing disagreeable odors, and presenting an unsightly appearance. To remedy this condition, scrape the ground around and under the can, spreading hot ashes over area scraped and occasionally burning over the ground with coal oil. On no account should cooks be allowed to sprinkle lime on the ground around the can without cleaning it properly, as they are prone to do, to save the labor of policing.

3. THE WASTES AT THE PICKET LINE. This is frequently overlooked especially in small camps, or in a large camp where there is a separate stable containing but a few horses. The most careful attention to the picket line is necessary in order to prevent flies breeding in the manure, as this is a favorite place for them to lay their eggs. All droppings must be taken out of the camp as soon as possible, and if not taken at least a mile away, should be burned, or buried, to the depth of at least three feet. It is recommended that ground occupied as picket lines be burned over with coal oil and straw at least once a week.

4. DISPOSAL OF FECES AND URINE. Having discussed the first three methods relating to wastes and their disposal, we now come to the fourth and most important. The necessity for the disposal of human waste, in camp, can not be impressed on the untrained with too much emphasis. No camp can be a healthful one if the greatest care is not taken of the sink, and of the disposal of its contents.

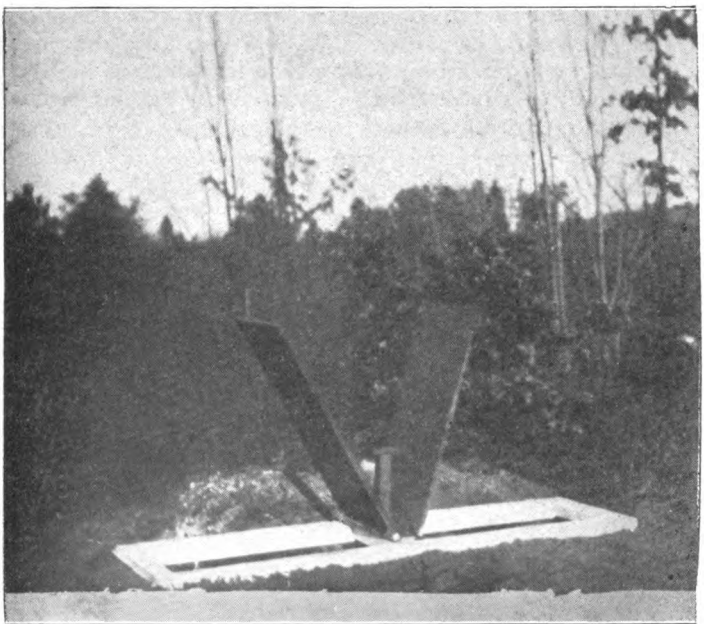
SINKS, THEIR PREPARATION AND CARE. In camps of one night, you will necessarily be unable to make very elaborate preparations for a "sink". Many authorities advise a shallow trench, or in fact several short trenches less than two feet deep, the men using them astride. They have the advantage of being easily and quickly made, and, by

reason of this slight depth, they permit more rapid disintegration of the excreta, and are easily filled on breaking camp. If this kind of sink is used, make it large enough to accommodate 5 per cent of the command.

A description of this form of latrine, the straddle trench, is not complete without reference to the cover devised and introduced into general use in the Army by Major R. U. Patterson, Med. Corps., U. S. A., after observing a somewhat similar trench cover in the camp of the New York Engineer Militia. As seen from the description of the straddle trench previously mentioned, there are no precautions taken to prevent the entrance of flies. In order to obviate this defect, the cover devised by Major Patterson, and somewhat modified by the author, see plate No. 10, proved very satisfactory when used on recommendation of the author in a camp of the Provisional Cavalry Brigade in 1913 en route from Winchester, Va. to Washington, D. C.

THE PIT LATRINE. On the other hand, the old-fashioned pit sink with its improvised seat, requires more labor in construction, but it is believed that the men will be less tempted to use unauthorized places in the camp. If the ordinary type of sink is selected, the rule is to dig it two feet in length for every five men. This rule is not invariable, as there is a difference in the strength of organizations. For example, for a troop of 65 men, a sink of 15 feet

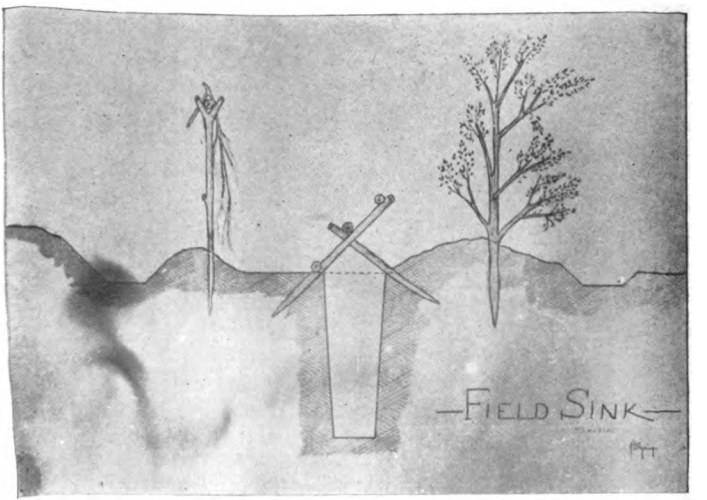
PLATE 10.—STRADDLE TRENCH COVER.



The cover shown is designed for a trench nine inches wide and six feet long with a depth of eighteen inches. The "seating" capacity is for two. The lid for each opening falls unless held open, by reason of the "T" piece in the center. The material used is 18 feet of 2′ by 4′ and 6 feet of plank one foot wide, and four strap hinges.

long will be sufficient. The pit must be three feet wide, about two and one half feet deep. Of course this contemplates using it for one night only, and on the following morning. In a temporary camp, (and this sink is suitable only in such camp) dig a pit of the following dimensions:

PLATE 9.—FIELD SINK. Col. V. Havard, U. S. A. (Section)



Showing shape of pit, relative position and method of screening with brush, and also a point often neglected, the protecting ditch to prevent overflow in the event of rain.

Length 15 feet.
Width 3 "
Depth 6 "

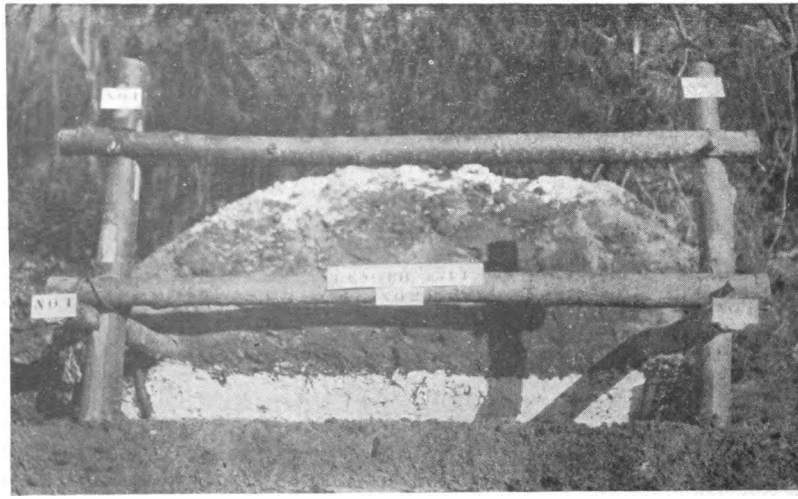
The correct shape, method of screening, and also ditching of sink is shown in Diagram No. 9.

A very recent tendency has developed to revert to this type of sink in camps of concentration, and the results have been quite satisfactory. The box covering the pit and forming the seat is of a modified Havard type. It is better made of tongue and groove material, and provided with a "dust flap" (as at the bottom of a tent) in order to make it fly proof. The latrine shelter as now made consists of simply a screen witout a roof. A suggestion by Major W. J. L. Lyster, Medical Corps, U. S. A., that the cover for the seat be made fan shaped and larger than that usually furnished is very much to be desired, as it protects the seat in rainy weather and adds greatly to the comfort of the men.

The best method of caring for the contents of this type of latrine is to burn it, using one or more quarts of oil and an armful of straw as fuel. A daily incineration at about 8 a. m. is advised. An earlier hour is not necessary as with the regular incinerator.

Always close your sink when it is filled to within two feet of the surface, except when a shallow trench is dug for use on the march, the depth of which is less than two feet. In all cases replace the sod after filling the sink and mark the site. In addition to the

PLATE 11.—SEAT FOR FIELD SINK. (Improvised)



Showing: No. 1, the four uprights, and No. 2, the pole for seat. The back rest is also shown, the distance from the seat pole being the length of a man's forearm from the elbow to the knuckles of the hand. The length of seat indicated is for a troop or company, viz. 15 feet.

rule given to determine the length of the sink, there are a few simple rules that a working party can easily remember when preparing material for the sink seat, see Plate No. 11.

1. Cut four poles as large around as can be grasped with both hands, fingers touching, their length to reach from the ground to the top of the ear of the ordinary man. They are the uprights.

2. Cut one pole of the same diameter, its length equaling that of the sink. This is for the seat.

3. Cut one pole the same length as the sink its diameter that of the wrist: this is for the back rest.

Sharpen the poles intended for the uprights as high as the knee and drive them into the ground at each end of the sink, as indicated in Diagram No. 11. Drive them deep enough to form the seat at the height of the knee. This will give the correct height for the seat. This point is important for comfort.

If a back rest is desired, and one is recommended, place it at a point shown in the Diagram No. 10. The distance from the seat rail to be the length of a man's forearm, from the elbow to knuckles of hand.

THE CARE OF THE SINK. The following precautions are necessary in the proper care of the sink:

1. Screen it with "brush."

2. Whenever possible, have a tent fly to cover the sink. A fly is much better than a tent, which is always too small, poorly ventilated, and prevents the admission of sunlight, which is much desired as a disinfectant. A tent is a refuge for flies in bad weather, and, as the tent is usually infected in a short time, becomes a source of danger. not only as a covering for a sink, but in the stress of a campaign may be issued knowingly, or otherwise as shelter for men, a purpose for which it is obviously unsuited, until thoroughly cleaned and disinfected.

3. Put a light in your sink at night.

4. Insist that each man cover his deposit with earth by means of a scoop, made of a piece of scrap tin, by the artificer of the organization.

5. In making the sink, throw all the earth to the rear.

6. Burn out your sink daily with coal oil, say about a quart, or with hay, leaves or straw.

7. Make a seat for the sink. Make the sink comfortable so that the members of your command may not be tempted to seek unauthorized places to relieve themselves. This is not the only reason. Many cases of constipation and its attendant illness are brought on in camps where the sinks are allowed to become unclean, and are so repulsive to the men, that they will not use them.

8. Be careful that the ground in front of the sink does not become foul from urine. Have the ground scraped each day, say at 10 a. m., and the earth covered with hot ashes. This also is the best time to burn your sink, as three fourths of the members of the company have used it for the day.

9. Ditch the sink with the same care as a tent. Nothing adds more to the discomfort of a camp than to find, as the writer did, some years ago on a Sanitary Inspection, that after a sudden downpour of rain most of the camp sinks were flooded and could not be used. What was very much worse than that, their contents washed over the ground surrounding the sinks.

10. Portable seats are often advocated on the plea of additional comfort, and decrease of labor on the march. As they become infected, usually at once, and are likely to be packed with any part of the baggage on the wagon, they form a source of danger, and their use should only be permitted if tied outside the wagon on the march.

11. If possible, it is believed best to have a man detailed whose duty it is to see that each man covers his deposit with earth, before leaving the sink, and also to have charge of the general police of the sink. Many plans have been suggested as to the best methods of caring for the sink. Some authorities believe that a daily police is sufficient placing dependence on each man to cover his

posit. After some years of experience in the field, such a plan is not believed to be feasible. In detailing a man for duty, in charge of the sink, I recommend the detail be not made as a punishment, but that it be made by roster as for other duties, such as guard, etc. If such a detail becomes regarded by troops as a punishment, the man so detailed would take no interest in it, and the duty would be correspondingly slighted, and thus the object of the detail would be defeated.

12. See that a proper receptacle is placed in the sink for toilet paper. This is not a point in sanitation, but its observance will add greatly to appearances as it prevents the paper from being blown about camp.

13. It is advised by some that the sinks be located to the leeward of camp. This is not of great importance, as the leeward of today may be the windward of tomorrow, and as the manner of laying out the camp is prescribed in the Field Service Regulations. There is, however, one point I wish to make, with references to a modern camp, and that is, that it be taken as a general rule that the sinks be placed as far as possible from the kitchen, and not just beyond the kitchen, as was the custom a few years ago. The reason for this change in location of the sink, is, that the ordinary fly, so often found in camps, and particularly in the sinks, frequently carries particles of filth or feces on its feet,

and may pollute the bread and such other food in the kitchen as will not be cooked before eating.

THE USE OF LIME IN CAMP. There is a tendency to ask for lime for use around the kitchen and sinks. This should be discouraged. Inasmuch as the mild slacked lime, such as is frequently issued, is so feeble a disinfectant, its use by the cooks about kitchen garbage cans, and at the sinks, becomes dangerous, as it conveys a false sense of security. For many years the routine use of disinfectants in garrison, has been prohibited by the Surgeon General of the Army. The same should hold good in the field. I have never been convinced that the white-washing of side rails of tents, hitching posts, saddle racks, garbage cans, or the inside of sheds for incinerators, sinks, kitchens, or other camp buildings, adds to the beauty of a camp, or that it improves its sanitary condition half as much as the liberal application of soap, hot water, and a scrubbing brush.

LOCATION AND CARE OF THE URINE CAN.

This very necessary appliance has become important during the recent years. We have learned that the urine of diseased persons, may, under some circumstances cause infection. The urine can is usually the ordinary galvanized iron can as issued by the Quartermaster Corps, but if such a can is not available, four ordinary tins, such as coal oil cans, will suffice, until cans can be obtained. The cans are placed in the company streets at ret-

at a point usually designated by the organization commander. The following rules relative to the care and use of urine cans are suggested.

1. Empty the can into the sink, or an incinerator, at reveille each morning. Clean the can thoroughly, and put it to sun all day.

2. Burn out the can with several handfuls of straw, and a half pint of oil, two or three times each week.

3. Mark the position of the cans at night with a lantern.

4. Burn over the place where the cans stood, each day.

5. When encamped on ground previously occupied by troops, make it a matter of routine to burn over the ground occupied by the old kitchen, the sink, and the urine cans. As a rule the old sites are easily determined.

DISPOSAL OF URINE AND FECES. In a large permanent camp, the method of disposal of urine and feces is quite different from that of temporary camps, which we have just discussed, and arrangements are much more satisfactory.

Necessarily, there are many methods required to meet the varying conditions. These range from a complete water carriage as was recently used near Galveston (by some of the organizations) down to expedients that are little better than those outlined

for temporary camps. The most satisfactory are the following:

THE REED TROUGH. This, briefly, is a long trough lined with galvanized iron, and containing water, to which is added either lime or coal oil.

The points that should be especially observed in its management, are:

1. To have one end of the trough six inches higher than the other.

2. Put sufficient water in the trough to raise it to six inches on level.

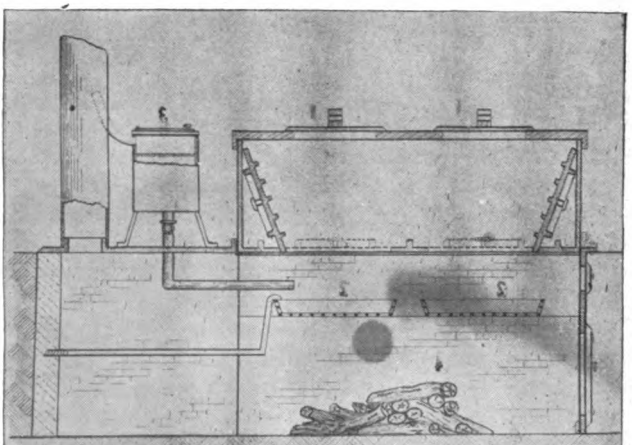
3. Put about one sixth of a barrel of lime (say two galvanized iron bucketfuls) into the trough with the water. If coal oil is used instead of the lime, put in about six quarts.

4. Have the contents stirred from time to time with wooden paddles, in order to mix them thoroughly. Do not allow anyone to throw foreign matter of any kind into the trough.

The trough is emptied by means of a sanitary cart and hand pump, and if waste matter, other than feces, urine, and toilet paper, be placed in the trough, it is very likely to clog the valves of the pump, and not only interfere with its operation, but also delay the operation of the sanitary carts in hauling away the waste from the toilets of fourteen or fifteen hundred men. The method of disposal just described, was designed by the late Major

ter Reed, Surgeon, U. S. Army. From a sanitary point of view and under favorable conditions, it is an ideal way of disposing of excrement but there are objections to it, chiefly because the valves of the pump often become clogged with foreign matter. A special tank cart is necessary, and in the absence of good roads, the trips are irregular, and the sinks

PLATE 12.—INCINERATOR.



Showing a type of incinerator in use in the army. 1. The seats. 2. Pans for reception of deposit. 3. Urine can. 4. Fuel used when incinerator is to be burned out.

are not promptly emptied. It is also difficult to operate in freezing or wet weather.

INCINERATION. This method of burning, or usually charring the feces (and evaporating the urine) is the most modern, and the most satisfactory now in use. The chief reason for its being the most satisfactory, is, that the waste in question is destroyed at the place of its original deposit, that it is not handled or carted, and the dangers of infection are reduced to a minimum. There are many devices for incineration, each possessing its own peculiar advantage. As yet, however, none are believed to fulfill all requirements. In general terms, an incinerator consists of one or two pits, usually with a common smokestack. In these pits are iron pans which receive the feces and urine. Above the pans are seats, resembling the seats of an ordinary water closet. The pits are used alternately, in order that the contents of the pans may be burned out. Plate No. 12 shows a type of incinerator.

CARE OF THE INCINERATOR. In general the rules regulating the police of the incinerator shed, are the same as for the sink. There are several points, however, to be borne in mind. Frequently, when large bodies of men are brought together, an outbreak of "crab lice" occurs. This can usually be traced to the seat of the sink or incinerator. To prevent this condition the seats of the sink or

incinerator must frequently be cleaned with scalding water and soap. Disinfection should be proceeded with under the supervision of a medical officer.

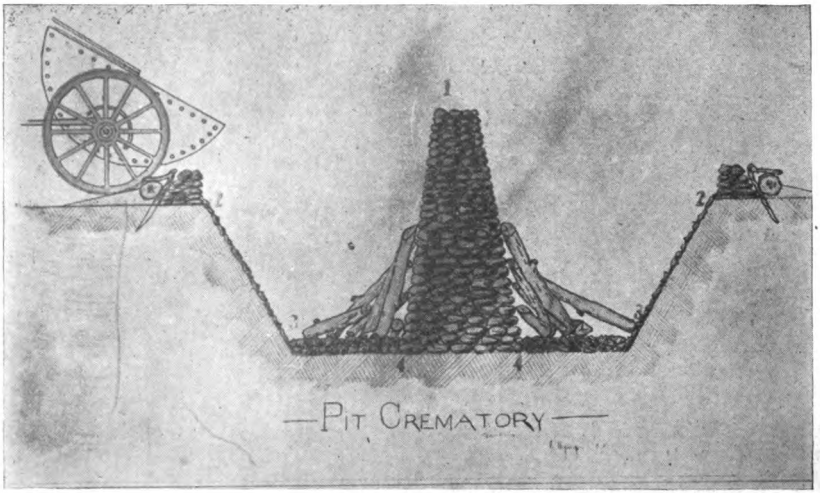
HOUR BEST SUITED FOR INCINERATION. Unfortunately, as yet, no apparatus has been devised that will destroy the odor that results from burning out an incinerator, particularly during the evaporation of the urine. It is therefore, strongly recommended that the incineration, which usually requires about three hours, commence at about 1 o'clock, a. m., at a time when food is neither being eaten nor prepared. Most of the tents are then partially closed, and there is less call for the use of the sink. Indeed, if care is taken that the incinerators of an organization are burned out in proper order, it will be found that frequently all the incinerators can be burned out during the night. This results in a full quota of seats being available the next morning, a condition much to be desired, since considerably over half the organization will use the sink in the first hour after breakfast. Sometimes there is evidence that some of the men have stood on the seat while attending to the calls of nature. This very dirty and dangerous practice may be prevented by placing a wooden bar about three inches in diameter, at such a height above, and parallel to the seats, that men using them will be compelled to take a sitting position.

THE HAVARD SINK BOX, as advocated by Colonel Valery Havard, U. S. Army, retired, should be used, and is described as follows: "The latrine box is 10 feet 3 inches wide at the bottom so as to safely cover a pit 3 feet wide. The sides or walls have an inward slant of 4 inches and are locked together by the end pieces and two traverses. The top consists of two longitudinal halves, simply laid on and kept from slipping by blocks; each 21 inches wide, projecting 2 inches beyond the side and perforated by holes which alternate with those of the other half. Each hole, 11 inches long, is covered with a strong hinged lid which can only be raised to an angle of 45 degrees, so that it is self-closing and prevents standing on the edge of the box.

"Each box consists of 8 pieces perfectly interchangeable with those of any other box, and weighs 175 pounds. It can be put together without screw, bolt or hook, or taken apart, by one or two men in a few minutes."

THE PIT CREMATORY. In the remark relative to the disposal of kitchen garbage, the kitchen incinerator was mentioned. Sometimes it will be found impracticable, or undesirable to dispose of the garbage in this way. If for any reason the waste of a camp is to be burned at a single point, and by a particular method, the pit crematory is

PLATE 13.—PIT CREMATORY.



This efficient and very satisfactory method is required only when there is an abundance of fuel, and it is desired to consume large quantities of wastes in a relatively short time.

recommended. This is an excellent way to dispose of all waste from a camp. It is practicable and has stood the test of armies in the field for many years. The arrangement consists of a circular pit, the edges sloping toward the center, and is of the following dimensions:

Diameter at top 15 feet.
Diameter at bottom 12 feet.
Depth 5 feet.

The sides and bottom of the pit are lined with small boulders from 6 to 8 inches in diameter. In the center of the pit is built a pyramidal shaped mound, the latter being of clay and boulders, the same size as those used to line the pit. Its diameter should be: Four feet at the bottom, gradually tapering to a diameter of two feet at the top, and about six feet high. The object of this pyramid is to cause a draught. A fire is built in one quadrant of the pit with cord wood, and after it is under a good headway the garbage is slowly added; the fire is then started in the adjacent quadrant where the same procedure is repeated. In the course of the incineration, the fire will have to be worked around to the starting point, and it will be found that the hot rocks have converted the liquid garbage into steam, and that the solid garbage not already burned will be sufficiently dried to be used as fuel. A cord of wood will consume about 2 tons of garbage. A ramp about one foot high should be made,

in order to facilitate the dumping of the carts into the incinerator. As has been stated, this is a practical and efficient incinerator. There is one disadvantage in connection with its operation, and that is, the large quantity of wood necessary to run it. Mention is made of this method of incineration, principally because large quantities of waste can be effectually disposed of, as for example: In an epidemic among the live stock of a command (and it is deemed better to burn than bury the animal), it will be found that the body of a horse can be consumed in this incinerator in three hours. This type of incinerator is seen in Plate No. 13.

There are many other methods of disposal of wastes in camp, but those that have been outlined, are believed to be the principal ones with which you will be brought in contact. In passing, I would call attention to another method:

THE TUB SYSTEM. I mention it, simply to condemn it, if it is handled after the manner common with troops. For obvious reasons, the use of these tubs is inadvisable, since they are not protected from flies. The tubs soon become saturated with filth, and are constantly distributing filth en route to the dumping ground. This is, perhaps, the least desirable method of disposal of camp wastes. Although it may not be pertinent at this point, I would remind you of the necessity of washing your hands after going to the sink, and before

meals. This is important, as men may pollute their hands from the filth of the seat, left there by some comrade. Many cases of typhoid fever have undoubtedly been traced to this source.

REASONS FOR THE DISPOSAL OF WASTES.

The extreme care which I have emphasized as necessary in handling and disposing of wastes, both in camp and on the march, is assigned to one or both of the following reasons:

That filth allowed to remain in and about camp, tends to produce disease in many ways and because it promotes the breeding of flies and vermin.

That by means of flies, dust, and other media, the germs of disease may be carried to the kitchen and other places, and result in sickness. The importance of the care of empty cans on the "dump" of a permanent camp is often overlooked. If they contain rain water, as they often do, they become a most excellent breeding place for mosquitoes.

CARRIERS AND AMBULANT CASES. Another source of danger when large bodies of men are assembled in camp, is due to what has come to be called a "typhoid carrier." By this term is understood a person who has had typhoid fever, and still harbors the germs of typhoid in his intestinal canal, voiding countless numbers of the germs in his feces and urine. The "carrier" is usually in apparently

good health, and is not regarded on casual observation as a focus of disease. These "carriers" are probably responsible for the outbreaks of typhoid fever in organizations, from apparently unknown causes.

Another cause of the infection of sinks, is the ambulant or walking cases of typhoid. These men, although suffering from a mild attack, void germs in their feces and urine that are capable of producing serious results in a comrade.

THE HOUSE FLY. In concluding the chapter on wastes, the following brief extract is made from a report of the United States Department of Agriculture, on the common house fly, as it bears such a close relation to the cause of diseases, both in barracks and in the field.

There are several species of the house fly commonly found, although one is known as the house fly proper. It may be described as follows: It is of medium size, and gray in color. It can not bite as its mouth is suitable for sucking only. The stable fly, often seen, and mistaken for the house fly, does bite, however.

LIFE HISTORY OF THE FLY. The eggs of the fly are usually laid in manure, preferably horse manure, and in decomposing organic matter of all kinds, and in human excrement. The eggs are laid by the female fly, to the number of about 100. After passing through several stages, the eggs, in about

ten days, result in a fully developed fly, so it is seen that (in the central states at least) eight or ten generations of flies may develop in a single summer. Some of the diseases that are transmitted by flies, either by the medium of their feet or by sucking up the germs into their intestines, and afterwards infecting food by their feces, are:

Cholera.
Dysentery.
Conjunctivitis.
Typhoid fever.
Tuberculosis.

CAMPS. As has been stated, camps are divided into permanent or standing camps, and temporary camps. A classification from a sanitary point of view would be that all camps of less than ten days duration should be called temporary camps, for, during that period the fly does not mature.

CHAPTER 7.

FIRST AID.

CHAPTER 7.

FIRST AID.

a. General rules.
b. Burns, scalds, and frostbites.
c. Foreign bodies in the eye, ear, nose and throat.
d. Fainting and shock.
e. Convulsions.
f. Poisonous plants: snake and insect bites.
g. Resuscitation of the apparently drowned.
h. Fractures and sprains.
i. Hemorrhage.
j. Improvised transportation.

FIRST AID.

The following pages are written with a view to giving an outline of "First Aid" as a guide for non-commissioned officers and privates of the line, until a medical officer, or member of the hospital corps is able to render further assistance.

Nothing new has been suggested in first aid, and the procedure outlined in the usual textbooks on the subject, has been largely followed except in a few instances. An effort has been made to simplify the subject, by outlining one simple method of first aid, designed to meet a particular condition, rather than to confuse the uninstructed by several

methods, at the same time recommending only those drugs and appliances that are constantly on hand in the field. The following are a few simple rules to be observed in case of accident.

1. Do not crowd around the sick man; give him plenty of fresh air.

2. Open his clothes, especially around the neck and chest.

3. Keep his head low, particularly in case of fainting and bleeding.

4. Send for a surgeon while administering first aid.

5. Place the patient on his back; this is usually the most comfortable position.

6. In case of doubt as to the injured part compare the injured with the sound side of the body, as for example, the supposedly broken leg with the sound one.

BURNS AND SCALDS frequently happen in camp kitchens, and are best treated by using cooking soda, a teaspoonful to the pint of water, and applying a first aid bandage soaked in this solution. Occasionally blisters may form as a result of a burn. In such case it will be necessary to open them. Do so in the same manner as has been described for treating blistered feet.

FROSTBITE. By this is meant the freezing of a part of the body, as for example, the fingers or toes,

or part of the face. These are the parts most commonly affected. The symptoms of frostbite are tingling and redness. Later the part becomes white. The treatment for frostbite consists in rubbing the affected parts with snow, and placing them in cold water. Then rub the flesh with the hands, gently at first, and later more briskly. On no account let the patient go into a warm room, or place the frozen parts in warm water. In case a person is overcome by the cold, and is in a stupor as a result of his exposure, the following treatment is necessary:

1. Remove outer clothing in a cool room.
2. Rub whole body briskly with the hands.
3. As soon as the patient is able to swallow, give coffee and hot drinks of any kind, later whiskey or brandy.
4. As soon as the patient has reacted well, wrap in blankets, place hot bricks or bottles filled with hot water around him.

FOREIGN BODIES IN THE EYE. Frequently insects enter the eye. They are best removed, if one is not adept enough to turn back the lid, by drawing the upper lid away from the eyeball by the lashes, and pulling it down. Then let it return to its position, so that in doing so the lashes of the lower lid will sweep the inner side of the upper lid. Or, by pressing the surface of the eyelid from without, downward and across toward the nose.

This is the direction the tears flow across the eyeball.

FOREIGN BODIES IN THE EAR. This is usually an insect, and to get it out, turn the affected ear up by inclining the head so that the unaffected ear is lower. The insect will frequently crawl out. If this is not successful, put a few drops of warm oil in the ear. This invariably forces the insect out or kills it, and relieves, in a great measure, the intense pain that sometimes occurs from the movements of the insect on the drum of the ear. If the foreign body is a vegetable substance as for example, a bean, do not put any liquid in the ear as it will cause the foreign body to swell, and render it more difficult to remove. Try to remove it by jarring the side of the head.

FAINTING. The condition known as fainting, is due to sudden lack of blood in the blood vessels of the brain. Therefore, on no account raise the head of the one who has fainted, but place the patient on his back, on the ground, with his head low. Open the clothing around the neck, and give a little stimulant of some kind as soon as the patient is able to swallow. If stimulants are not available, sprinkle the face and neck with a little cold water. In any event, give the patient plenty of fresh air.

SHOCK. This condition usually follows a serious accident. For example, a broken leg, or a gun-

shot wound. The treatment of this condition, the symptoms of which are pallor, and faintness, is fresh air, quiet, keeping the head low, stimulation, and making the patient as comfortable as possible without moving him.

STUNNING, or concussion of the brain, is a condition often seen with mounted troops, and may be caused by a fall from a horse, the individual striking on his head. There is generally a brief unconsciousness, and the treatment consists in laying the patient on his back, and applying cold cloths to his head. On regaining consciousness, keep the patient quiet for several hours.

FITS OR EPILEPSY. The treatment of this condition is to make the person as comfortable as possible and after his attack is over, permit him to sleep. This the patient generally desires to do. During the fit, prevent his injuring himself, particularly, biting his tongue. This is done by placing a folded handkerchief between the teeth. Do not neglect to loosen the clothing around the neck and chest.

POISON OAK AND IVY. The best treatment of this affection, is that prescribed for burns, i. e., a solution containing cooking soda. If, however, one has knowingly come in contact with these plants, the poison can frequently be removed by immediately washing the parts that have been exposed, with dilute alcohol, or whiskey.

SNAKE BITES. Treat snake bites as follows:

1. Cut twice across the wound, in order to cause it to bleed freely. Wash out as much poison as possible.

2. Suck the wound if you have no sore or abrasions in your mouth.

3. Tie a cord or handkerchief above the wound if it is in a limb, and draw it as tight as the patient can stand. The hat cord is one of the articles that serves best as a constrictor for this purpose, and may be used in cases of severe bleeding.

INSECT STINGS. These are best treated by making a poultice, either of clay, or baking soda, and placing it over the affected portion.

SUNSTROKE. There are two kinds of sunstroke:

1. Sunstroke proper, in which the patient becomes unconscious, very hot, but does not perspire. In this case apply cold cloths to the head, take the patient into the shade, and cool the body as much as possible.

2. In the condition which is known as "Heat Exhaustion" the patient perspires freely, is cold, clammy, and the skin is pale. The symptoms are much like shock, and the treatment is the same. Fresh air, shade, stimulation with whiskey, or aromatic spirits of ammonia.

RESUSCITATION OF ONE APPARENTLY DROWNED.

On taking the patient from the water:

1. Loosen the clothing, and, if possible, take it off at once, and wrap the body in a blanket.

2. After the clothing has been removed, proceed as follows:

A. Turn the patient on his face.

B. Grasp him about the waist while standing astride of him, and raise the middle of his body to let the water run out of his throat and nose; at the same time have the tongue pulled out by several sharp pulls. This stimulates respiration, and will sometimes start the breathing.

C. Then place him on his back, with a roll of clothing under his shoulder blades, so as to throw his chest forward. When this has been done, kneel at the man's head, facing his feet, place one knee on each side of his head; grasp his arms near the elbow, lift them and draw toward you, spreading your hands; hold the arms in this position until you have counted four slowly, then bring the arms back to a position along the chest wall, and press them firmly against it, in order to force out any air in the chest.

D. Continue this for at least one half hour, even though the patient shows no sign of returning to life.

E. Don't permit the patient to become chilled any more than possible, as it will lower his vitality.

Recently the War Department has directed that the Schaefer Method of resuscitation be used. Bulletin 37, August 13, 1914, War Department outlining the procedure is as follows:

In the instruction of the Army in first aid, the method of resuscitation of the apparently drowned, as described by Schaefer, will be taught instead of the "Sylvester method," heretofore used. The Schaefer method of artificial respiration is also applicable in cases of electric shock, asphyxiation by gas and of failure of respiration following concussion of the brain.

Being under water for four or five minutes is generally fatal, but an effort to revive the apparently drowned should always be made, unless it is known that the body has been under water for a very long time. The attempt to revive the patient should not be delayed for the purpose of removing his cloths or placing him in the ambulance. Begin the procedure as soon as he is out of the water, on the shore or in the boat. The first and most important thing is to start artificial respiration without delay.

The Schaefer method is preferred because it can be carried out by one person without assistance, and because its procedure is not exhausting to the operator, thus permitting him, if required, to con-

tinue it for one or two hours. Where it is known that a person has been under water for but a few minutes, continue the artificial respiration for at least one and a half to two hours before considering the case hopeless. Once the patient has begun to breathe, watch carefully to see that he does not stop again. Should the breathing be very faint, or should he stop breathing, assist him again with artificial respiration. After he starts breathing do not lift him, nor permit him to stand until the breathing has become full and regular.

As soon as the patient is removed from the water, turn him face to the ground, clasp your hands under his waist and raise the body so that any water may drain out of the air passages while the head remains low.

SCHAEFER METHOD

The patient is laid on his stomach, arms extended from his body beyond his head, face turned to one side so that the mouth and nose do not touch the ground. This position causes the tongue to fall forward of its own weight and so prevents its falling back into the air passages. Turning the head to one side prevents the face coming into contact with mud or water during the operation. This position also facilitates the removal from the mouth of foreign bodies such as tobacco, chewing gum, false teeth, etc., and favors the expulsion of mucus blood

vomitus, serum, or any liquid that may be in the air passages.

The operator kneels, straddles one or both of the patients thighs and faces his head. Locating the lowest rib, the operator, with his thumbs nearly parallel to his fingers, places his hands so that the

PLATE 14A.—ARTIFICIAL RESPIRATION.

The above illustration shows the Schaefer Method of resuscitation of the apparently drowned. Note the position of the patient's head and arms, also the arms and hands of the operator. The assistant is seen testing with a piece of absorbent cotton for respiratory action.

little finger curves over the twelfth rib. If the hands are on the pelvic bones, the object of the work is defeated; hence the bones of the pelvis are first located in order to avoid them. The hand must be free from the pelvis and resting on the lowest rib. By operating on the bare back it is easier to locate

the lower ribs and avoid the pelvis. The nearer the ends of the ribs the hands are placed without sliding off the better. The hands are thus removed from the spine, the fingers being nearly out of sight.

The fingers help some, but the chief pressure is exerted by the heels (thenar and hypothenar eminences) of the hands, with the weight coming straight from the shoulders. It is a waste of energy to bend the arms at the elbows and shove in from the sides, because the muscles of the back are stronger than the muscles of the arms.

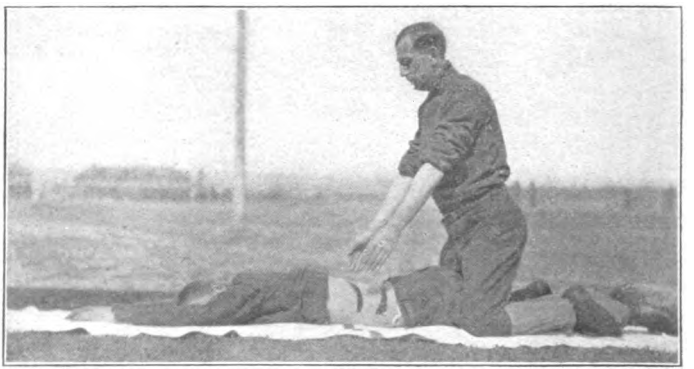
The operator's arms are held straight, and his weight is brought from his shoulders by bringing his body and shoulders forward. This weight is gradually increased until at the end of the three seconds of vertical pressure upon the lower ribs of the patient the force is felt to be heavy enough to compress the parts; then the weight is suddenly removed; if there is danger of not returning the hands to the right position again they can remain lightly in place, but it is usually better to remove the hands entirely. If the operator is light, and the patient is heavy, the operator can utilize over 80 per cent of his weight by raising his knees from the ground and supporting himself entirely on his toes and the heels of his hands—the latter properly placed on the ends of the floating ribs of the patient. In this manner he can work as effectively as a heavy man

A light feather or a piece of absorbent cotton drawn out thin and held near the nose by some

one will indicate by its movements whether or not there is a current of air going and coming with each forced expiration and spontaneous inspiration.

The rate of operation is from 12 to 15 times per minute and should not exceed this; the lungs must

PLATE 14B.—ARTIFICIAL RESPIRATION.



The above illustration shows the position of the operator's arms and hands when about to apply pressure. Note the black lines on the patient's back, indicating the location of the twelfth rib and the crest of the pelvic bones.

be thoroughly emptied by three seconds of pressure, then refilling takes care of itself. Pressure and release of pressure—one complete respiration—occupies about five seconds. If the operator is alone he can be guided in each act by his own deep, regular respiration, or by counting, or by his watch lying

by his side; if comrades are present, he can be advised by them.

The duration of the efforts at artificial respiration should ordinarily exceed an hour; indefinitely longer if there are any evidences or returning animation, by way of breathing, speaking, or movements. There are liable to be evidences of life within 25 minutes in patients who will recover from electric shock, but where there is doubt the patient should have the benefit of the doubt. In drowning, especially, recoveries are on record after two hours or more of unconsciousness; hence, the Schaefer method, being easy of operation, is more likely to be persisted in.

Aromatic spirits of ammonia may be poured on a handkerchief and held continuously within 3 inches of the face and nose; if other ammonia preparations are used, they should be diluted or held farther away. Try it on your own nose first.

When the operator is a heavy man, it is necessary to caution him not to bring force too violently upon the ribs, as one of them might be broken.

Do not attempt to give liquids of any kind to the patient while unconscious. Apply warm blankets and hot-water bottles as soon as they can be obtained.

FRACTURES. By the term fracture is meant a broken bone. The pain from a fracture is principally due to the sharp edges of the broken bones, tearing and pressing on the delicate nerves in the limb, and for this reason it is necessary to prevent,

as much as possible, any movement of the limb, and, of course, the bones. This is accomplished by what are known as splints. The latter, in the field, may be improvised from many different materials. An excellent splint is one made from the shelter tent poles and the blanket, both articles being nearly always at hand, and it is readily made. Plate No. 15 illustrates how it is used for fractured leg. No instructions are given in these pages of the methods of reducing fractures or resetting the bone, as it is commonly called, as it is believed that an attempt to do this (by the inexperienced) would result in needless pain to the patient, already in great suffering. The first aid to be rendered, in this case, would be to make the patient comfortable until treatment can be given by a surgeon.

TREATMENT OF FRACTURES. The main point in the treatment of fractures by means of first aid, is, to immobilize the part, or prevent movement of the broken bones. If, however, from any cause, there is a wound at the point of fracture, the greatest care must be taken that no dirt enters it, for if this happens, there is danger of blood poisoning, and the possibility of amputation of the limb. Hence, immediately put a first aid packet over a wound and, in fracture or injuries of the arm, use a sling. A very good sling may be made, either with the [illegible]ouse, or the olive drab shirt, by splitting the

seam and bringing up the skirt of the garment resting the arm in it, and cutting a buttonhole in the cloth at the correct height, with a knife, then buttoning the skirt to the front button of the blouse or shirt pocket. As shown in Plate No. 16.

A few of the commonest fractures, and the method of rendering first aid treatment, are:

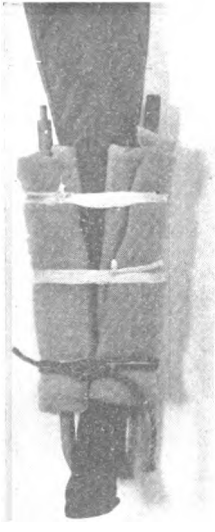
FRACTURED COLLAR BONE. In this case a figure of eight bandage is tied around the shoulders so as to draw them back, or, simply make a sling for the arm to prevent sagging of the elbow.

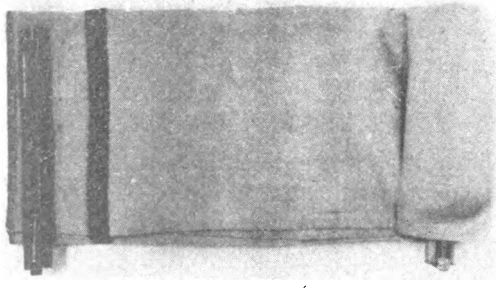
FRACTURED ARM OR FOREARM. Put an "L" shaped splint from arm pit to ends of fingers. This splint is placed on the inner side of the arm. Reënforce it by a short splint on the outer side and place the arm in a sling. This is also suitable in case of a fractured wrist.

FRACTURED RIBS. These are best treated by placing firm pressure over the whole of the affected side of the chest, in order to restrict its movement as much as possible, and thereby prevent the broken ends of the rib from injuring the lung, or tearing the other soft parts. The bandage in the first aid packet may be used, winding it around the chest; or the waist belt may be employed for the same purpose, either with or without the bandage.

FRACTURE OF THE THIGH. The object of the dressing in this instance, as in all cases of fracture, is to reduce the possibility of movement of the

PLATE 14.—BLANKET SPLINT.





This is a thoroughly practical and efficient splint, and has the advantage that the material is always at hand. On the right are shown two shelter tent poles on a folded blanket, the right end of the splint partially rolled. On the left is seen the method in which the splint is used.

PLATE 16.—COAT SLING FOR ARM.

The figure shows on the right arm the well-known use of the hat cord as an improvised tourniquet. On the left arm the use of the skirt of the coat as a sling for the arm, and also the "drum stick" tourniquet to control hemorrhage.

injured limb. The best way to do this is to make a long splint for the outside of the leg. One of the best improvised splints for this purpose, is the rifle,

with the butt in the arm pit, and the piece bound tightly to the leg. Fasten an inner splint on the injured leg by means of several handkerchiefs, pieces of first aid bandage or for that matter, several coat straps from a saddle. The inner splint may be made of a bunch or reeds, cornstalks, a blanket rolled around a shelter tent pole, or a carbine boot. In addition to this, tie the legs and feet together, as this will prevent the wounded leg from twisting, a movement which is very likely to occur by reason of the weight of the foot, and which is extremely painful.

FRACTURED LEG. Here the treatment is practically the same as that for a fractured thigh. Remember in either case, that when transporting the patient up and downstairs, where the lower extremities are injured, carry him feet up. This will prevent the weight of the body sliding down, and forcing the ends of the broken bones into the tissues.

In concluding the subject of fractures, the following material often found in the field is suggested to improvise splints, and is as follows:

Corn or sugarcane stalks.
Shelter tent poles.
Rifle.
Roll made of blanket.
Sabre and scabbard.
Bayonet and bayonet scabbard.

Twigs, grass, or other material twisted into a bundle, that will in any way assist in keeping the broken bones immobile.

DISLOCATIONS. It will be well at this time to take up the subject of dislocations, or, as it is usually described, "throwing a bone out of place". In the event of this accident, a general rule may be given: pull the limb steadily, following the direction away from the body. If this does not cause the bone to return to its place, treat it as a fracture, and send for a surgeon at once.

BLEEDING. For practical purposes in teaching elementary first aid, it is believed that all external bleeding may be classed as either slight or severe. I know this classification is unusual, and a great many may think it incomplete, but for the average lay student of first aid, it will prove sufficient, and will not result in confusion and hesitation in his adopting the few facilities that are usually at hand.

Slight cases of bleeding are those that can be controlled by direct pressure at the bleeding point. Severe bleeding is that which requires pressure above the wound nearer the heart to control it.

WOUNDS. The principal points to be observed in the case of wounds in the field are the following:

1. Stop the bleeding.

2. Apply first aid packet. The instructions in the packet direct the manner in which

PLATE 17.—FIRST AID PACKAGE.

Showing the method of holding the first aid package when about to apply to a wound. The importance of the application of this dressing as indicated in the instructions on each package can not be too strongly urged.

it is applied and must be strictly followed. As shown in Plate No. 16.

3. On no account permit dust or dirt to get into the wound from dirty hands, dressings, water or clothing.

IMPROVISED TRANSPORTATION

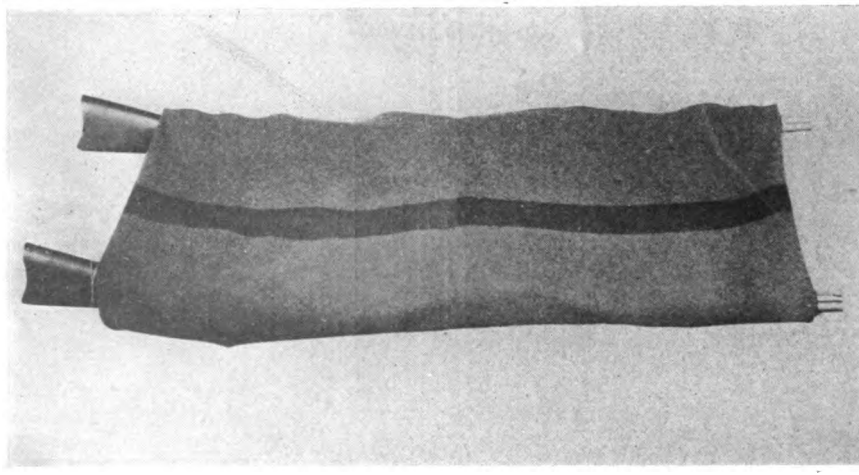
Having outlined a few methods of rendering first aid, it may be well to take up, in a general way several methods of improvised transportation. This question will often puzzle the novice more than the medical or surgical treatment of a case in the field.

IMPROVISED LITTERS. There are many types of improvised litters and those given here may suggest even better ones to anyone interested in the subject.

THE BLANKET LITTER. This is the regulation blanket litter and is made of a blanket and two rifles, shown in Plate No. 18.

THE POLE LITTER. This is made as follows: Cut two poles about as thick as the wrist, and about four paces long. Cut two other poles half as thick as the first, and about three feet long, or a little over one pace. Lay the long poles on the ground and cut two notches in each pole about six feet apart, or the height of a man. Lay your short poles in the notches and lash the ends with a guy rope from a shelter tent, so that they will hold the long poles apart. On this platform brush can be

PLATE 18.—BLANKET LITTER.



This litter made from the issue blanket and two rifles is satisfactory and reliable, and has the advantage of the material being always at hand.

laid, or two shelter tents tied around the poles. If at hand, two ordinary grain sacks may be slipped on the long poles after cutting a hole in each corner of the bottom of the sack and before the cross pieces are tied on, and as a result you have a very satisfactory litter.

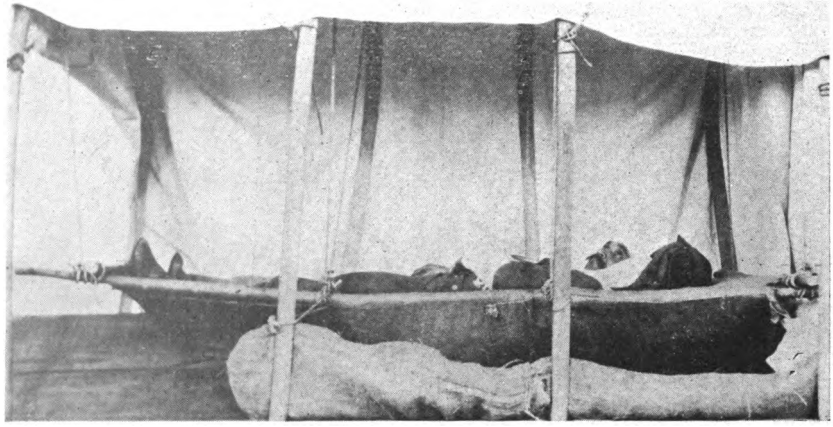
A very practical and satisfactory method of transporting a patient on a litter when a field wagon is available, suggested to me some years ago by the late General Lawton, is to suspend the litter from the hickory bows supporting the cover of the field wagon, and it is found that a wounded or sick man will ride much easier in this manner than on the floor of the wagon, since the bows form a fairly satisfactory set of springs, and at the same time the wagon may carry the regular load. This method is shown in Plate No. 19.

THE IMPROVISED TRAVOIS. This appliance is used where it is desired to have the patient carried for some distance, by means of a horse or mule, either because of the impassability of the roads, or the absence of wheeled transportation. The idea of the travois originated with the North American Indian.

An improvised travois may be constructed as follows:

Cut two poles each about 8 paces long, and of a diameter depending largely on the variety of wood.

PLATE 19.—TRANSPORTATION IN FIELD WAGON.



This plate illustrates an improvised litter made from small poles, and 3 grain sacks stuffed with straw. The litter loaded is shown suspended over the wagon load, and from the bows of the wagon.

The average thickness is about such as you can clasp with both hands the fingers touching. Have one pole about one foot shorter than the other, so that the travois will ride over obstacles more easily and be more comfortable for the occupant. Place the butts of the poles to the front, and at 4 paces from the butt end cut a notch in each pole; about six feet further cut two similar notches. Cut two cross poles somewhat heavier than those selected for the improvised litter, and lash them to the long poles. Then place the litter on the poles as shown in Plate No. 20 If a regulation litter is not used. it will be necessary to swing the head end of the litter from the front cross piece of the travois in order to lower the head of the patient and to prevent his slipping off. A travois such as just outlined, with a litter previously described, and improvised from poles and a shelter half forms a practical and very satisfactory means of moving a patient, and is shown in Plate No. 20. (Note) The head of the litter is suspended and lowered. The triangular flap of the shelter tent is used to protect the face of the sick man. The surcingle has been converted into a breast strap. Nothing has been used in these appliances but the regular personal or horse equipment except the poles for the litter and travois.

PLATE 20.—IMPROVISED LITTER AND TRAVOIS.

Note the stirrup straps used to swing the travois. The surcingle is used as a breast strap. The triangular end of the shelter tent has been used to protect the patient's face and head.

CHAPTER 8.

SANITARY SERVICE IN CAMPAIGN

CHAPTER 8.

SANITARY SERVICE IN CAMPAIGN

MEDICAL PERSONNEL WITH AN INFANTRY REGIMENT.

1 Major, 3 Captains or First Lieutenants, 4 noncommissioned officers and 16 privates.

SERVICE IN CAMPS.

1. An ambulance service is organized and maintained by the ambulance companies.
2. Infirmaries are set up at designated points, equipped by the ambulance companies. Here trivial cases are cared for, the serious cases are sent to the field hospital.

SERVICE ON THE MARCH.

1. When out of the presence of the enemy, ambulances are distributed throughout the column. In the presence of the enemy ambulance companies are kept intact.
2. A man falling out from sickness or injury is sent with a pass, to the medical officer in rear. The latter returns the pass indicating thereon the disposition made of the man.

REGIMENTAL SANITARY SERVICE IN CAMPAIGN.

As far as practicable commanders keep their senior surgeons informed of contemplated movements in order that the sanitary service may make proper preparations.

Unless duly detached all sanitary troops accompany their units into battle. By direction of the regimental commander the band may be assigned to duty in the sanitary service.

Wounded of the regiments are cared for by the regimental sanitary troops. Those able to walk are directed to the rear. The others are taken to sheltered places as soon as possible.

During engagements a regimental aid station is established for each regiment. It is placed as near the firing line as possible, the usual distance being about one half mile. Equipment consists of extra boxes of dressings which are brought up by a pack mule or otherwise. The location of this station must be known to commanders and men, as twenty or thirty per cent of the wounded will be able to walk to it from the firing line. The regimental aid station (commanded by the major) and one assistant medical officer, three sergeants and a designated number of privates remain at the station. The other assistant surgeons and remaining enlisted men are distributed behind the line, and under cover as far as possible. They render any medical assist

ce practicable. At a cessation of hostilities or during a lull in the firing they advance and render first aid, such as administration of ammonia, hypodermic injections or application of first aid packages or tourniquets. They also direct those able to walk to stations in the rear. They apply diagnosis tags, and transport badly wounded to the regimental aid or collecting station. The greater part of the latter work can be done, of course, only after a cessation of firing. From this point, the regimental aid station, the patient is transported to the rear through the following sanitary stations.

DRESSING STATION.

Established by the ambulance company, the equipment being brought up by four pack mules. It should be protected from rifle and artillery fire. If possible should be near a stream and preferably on cross roads.

All wounded who can not walk are carried back to the dressing station. This station provides shelter and light diets in case of long engagements. If troops advance it is either evacuated or a field hospital may be brought up and established at its site.

The principal work of the ambulance company begins at the end of an engagement when the dressing station is evacuated into the field hospital. The personnel also brings the wounded on litters from the first aid to the dressing station.

From the dressing station patients not returned to the firing line are sent to the next unit in the rear

FIELD HOSPITAL.

Field hospitals are centrally located and beyond the zone of conflict, usually 3 or 4 miles in rear of the dressing stations. In combat the duties of a field hospital comprehend:

Reception of wounded. Providing shelter for wounded for a longer or shorter period. Preparation of food. Extensive, and in numerous cases, definite treatment. The sending of selected cases to other sanitary organizations. This hospital has a capacity of 216 beds.

STATION FOR SLIGHTLY WOUNDED.

Its purpose is to relieve dressing stations and field hospitals of the slightly wounded who can walk and require but little attention. One is established for each division.

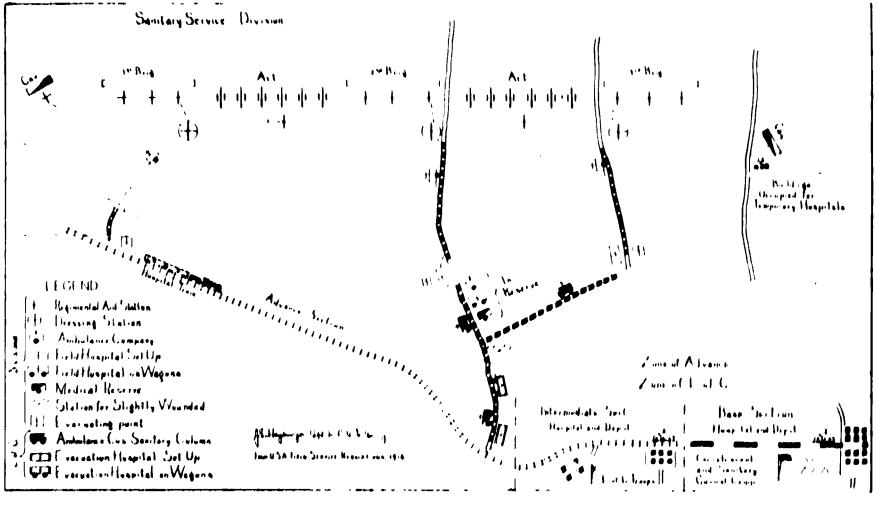
EVACUATION HOSPITALS.

The primary function of this hospital is to replace field hospitals so that the latter may move with their divisions.

The function of an evacuation hospital, is similar to that of a field hospital. This hospital has a capacity of 324 beds.

BASE HOSPITALS.

These are designed to receive patients from the field, and evacuation hospitals, as well as those originating on the line of communication. They are fitted as permanent hospitals at home. They should be established, one or more at the base, and others on accessible situations along the line of communication and occupy suitable buildings when available. They have each a capacity of 500 beds.


Sanitary Service Division
LEGEND
Regimental Aid Station
Dressing Station
Ambulance Company
Field Hospital Set Up
Field Hospital on Wagons
Medical Reserve
Station for Slightly Wounded
Evacuating point
Ambulance Cars Sanitary Column
Evacuation Hospital Set Up
Evacuation Hospital on Wagons
Advance Section
Zone of Advance
Zone of Etat G.
Intermediate Depot
Hospital and Depot
Base Depot
Hospital and Depot
Bridge
Occupied for
Temporary Hospitals

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